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Annotated Bibliography on the Biology of the Menhadens, Genus *Brevoortia*, 1963-1973

JOHN W. REINTJES and PEGGY M. KENEY

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627. Calico scallops of the Southeastern United States, 1959-69. By Robert Cummins, Jr. June 1971, iii + 22 pp., 23 figs., 3 tables.

628. Fur Seal Investigations, 1969. By NMFS, Marine Mammal Biological Laboratory. August 1971, 82 pp., 20 figs., 44 tables, 23 appendix A tables, 10 appendix B tables.

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635. A bibliography of the blackfin tuna, *Thunnus atlanticus* (Lesson). By Grant L. Beardsley and David C. Simmons. August 1971, 10 pp. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

636. Oil pollution on Wake Island from the tanker *R. C. Stoner*. By Reginald M. Gooding. May 1971, iii + 12 pp., 8 figs., 2 tables. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

637. Occurrence of larval, juvenile, and mature crabs in the vicinity of Beaufort Inlet, North Carolina. By Donnie L. Dudley and Mayo H. Judy. August 1971, iii + 10 pp., 1 fig., 5 tables. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

638. Length-weight relations of haddock from commercial landings in New England, 1931-55. By Bradford E. Brown and Richard C. Hennemuth. August 1971, v + 13 pp., 16 figs., 6 tables, 10 appendix A tables. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

639. A hydrographic survey of the Galveston Bay system, Texas 1963-66. By E. J. Pullen, W. L. Trent, and G. B. Adams. October 1971, v + 13 pp., 15 figs., 12 tables. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

640. Annotated bibliography on the fishing industry and biology of the blue crab, *Callinectes sapidus*. By Marlin E. Tagatz and Ann Bowman Hall. August 1971, 94 pp. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

641. Use of threadfin shad, *Dorosoma petenense*, as live bait during experimental pole-and-line fishing for skipjack tuna, *Katsuwonus pelamis*, in Hawaii. By Robert T. B. Iversen. August 1971, iii + 10 pp., 3 figs., 7 tables. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

642. Atlantic menhaden *Brevoortia tyrannus* resource and fishery—analysis of decline. By Kenneth A. Henry. August 1971, v + 32 pp., 40 figs., 5 appendix figs., 3 tables, 2 appendix tables. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

643. Surface winds of the southeastern tropical Atlantic Ocean. By John M. Steigner and Merton C. Ingham. October 1971, iii + 20 pp., 17 figs. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

644. Inhibition of flesh browning and skin color fading in frozen fillets of yelloweye snapper (*Lutzanus vivanus*). By Harold C. Thompson, Jr., and Mary H. Thompson. February 1972, iii + 6 pp., 3 tables. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

645. Traveling screen for removal of debris from rivers. By Daniel W. Bates, Ernest W. Murphey, and Martin G. Beam. October 1971, iii + 6 pp., 6 figs., 1 table. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

646. Dissolved nitrogen concentrations in the Columbia and Snake Rivers in 1970 and their effect on chinook salmon and steelhead trout. By Wesley J. Ebel. August 1971, iii + 7 pp., 2 figs., 6 tables. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

647. Revised annotated list of parasites from sea mammals caught off the west coast of North America. By L. Margolis and M. D. Dailey. March 1972, iii + 23 pp. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Continued on inside back cover.

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UNITED STATES
DEPARTMENT OF COMMERCE

NATIONAL OCEANIC AND
ATMOSPHERIC ADMINISTRATION
Robert M. White, Administrator

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ABSTRACT

A bibliography that consists of 444 references on the classification, distribution, abundance, life history, and ecology of American menhadens, genus *Brevoortia*. Included are references to menhaden published from 1963 through 1973 with those references published prior to 1963 that were omitted from menhaden bibliographies by Reintjes et al. (1960) and Reintjes (1964a). Brief annotations and a subject index are included.

INTRODUCTION

This bibliography is a continuation of those compiled by Reintjes et al. (1960) on the biology of the American menhadens and by Reintjes (1964a) on the menhadenlike fishes of the world. The literature included in this work includes the references published from 1963 through 1973 with those references published before 1963 that were omitted from the two bibliographies mentioned.

In reviewing the literature certain subject areas were used to decide which references should be listed. Included, in general, were references to taxonomy, distribution, occurrence, abundance, life history, morphology, ecology, and behavior. Excluded, generally, were references on the technological aspects of the fishery and the processing industry; daily, monthly, and annual landing reports and statistics; popular accounts in trade journals, newspapers, and magazines; and administrative and project reports. Mimeographed or similarly processed reports of an established series and special reports principally concerned with the biology of menhaden have been included as well as doctoral dissertations and master's theses that contained information on menhaden biology.

Arrangement of the references is alphabetical by author's surname. With multiple authors, the entry is made only under the senior author's name. Each author's works are listed chronologically by year of publication and those published in the same year are given alphabetical sequence by title. Anonymous articles are listed by the name of the journal or the originating agency.

Brief annotations of the contents of the publications that apply to menhaden and the scientific names of the species of *Brevoortia* concerned are given. This annotation is not done to make value judgments of the papers but to give clearer descriptions of the contents than can be obtained from their titles.

We acknowledge the help we received from Ann B. Hall, librarian, and the menhaden research staff of the Atlantic Estuarine Fisheries Center.

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BIBLIOGRAPHY

Ahlstrom, Elbert H.

1968. Development of fishes of the Chesapeake Bay region, an atlas of egg, larval and juvenile stages, Part 1 by Alice J. Mansueti and Jerry D. Hardy, Jr. Copeia, 1968, no. 3, p. 648-651.

A review of the book including a discussion of larval clupeid development with particular reference to the Atlantic menhaden.

Alperin, Irwin M.

1966. A new parasite of striped bass. New York Fish and Game Journal, vol. 13, no. 1, p. 121-123.

Isopod parasite, Livonica, in menhaden mouth.

Alperin, Irwin M.

1967. Notes concerning the occurrence of the snakefish (Trachinocephalus myops) in Long Island waters. New York Fish and Game Journal, vol. 14, no. 1, p. 86-88.

Cites Arnold (1951) reference to lizard fish feeding on small menhaden.

Altman, Philip L., and Dorothy S. Dittmer.

1964. Biology data book. Federation of American Societies for Experimental Biology, Washington, D.C., 633 p.

Physical and chemical characteristics of fats and oils of B. tyrannus.

Altman, Philip L., and Dorothy S. Dittmer.

1966. Environmental biology. Federation of American Societies for Experimental Biology, Bethesda, Maryland, 694 p.

Salinity tolerance of B. smithi from Gunter and Hall (1963).

Alverson, F. G., and G. C. Broadhead.

1971. International trade - fish meal. United Nations, Food and Agriculture Organization, UNDP Indian Ocean Program, IOFC/DEV/71/17, 42 p.

Menhaden fishery production discussed.

Anderson, William W.

1968. Fishes taken during shrimp trawling along the South Atlantic coast of the United States, 1931-35. U.S. Fish and Wildlife Service, Special Scientific Report - Fisheries no. 570, 60 p.

Number of Brevoortia by month.

Anderson, William W., and Jack W. Gehringer.

1965. Biological-statistical census of the species entering fisheries in the Cape Canaveral area. U.S. Fish and Wildlife Service, Special Scientific Report - Fisheries no. 514, 79 p.

Monthly landings of menhaden (genus Brevoortia) in the Cape Canaveral area 1959-62. Also incidental catch of menhaden in shrimp trawls by number of fish per hour and total by months.

Arnold, Edgar L., Jr.

1951. Northward dispersal of warm-water marine fishes in southern New England during the summer of 1949. Copeia, 1951, no. 1, p. 87-88.

Observed inshore lizardfish, Synodus foetens, feeding on small menhaden.

Austin, Herbert M., and Clarence R. Hickey, Jr.

1973. Spinal curvature in the Atlantic silversides, Menidia menidia (Linnaeus), and the Atlantic menhaden, Brevoortia tyrannus (Latrobe). Chesapeake Science, vol. 14, no. 2, p. 146-147.

One Atlantic menhaden, 37 mm fork length, with a curved spine was caught with 1,108 silversides, one of which also had a curved spine.

Baldauf, Richard J., and Molla F. Huq.

1963. A description of the larvae and juveniles of Brevoortia gunteri Hildebrand (Clupeidae: Pisces). (Abstract). Texas Journal of Science, vol. 15, no. 4, p. 435.

Young of both B. gunteri Hildebrand and B. patronus Goode are found in coastal bay areas of Texas. Larval and juvenile stages of the two species are superficially similar and difficult to separate.

Baldauf, R. J., J. Van Conner, H. W. Holcombe, and F. M. Truesdale.

1970. A study of selected chemical and biological conditions of the lower Trinity River and upper Trinity Bay. Texas A&M University, Water Resources Institute, Technical Report no. 26, 168 p.

Numbers and sizes of young Gulf menhaden by month, 1966-68.

Baughman, J. L., and S. Springer.

1950. Biological and economic notes on the sharks of the Gulf of Mexico, with special reference to those of Texas, and with a key to their identification. American Midland Naturalist, vol. 44, no. 1, p. 96-152.

B. patronus as food of sharks.

Bearden, C. M.

1965. Occurrence of spiny dogfish, Squalus acanthias, and other elasmobranchs in South Carolina coastal waters. Copeia, 1965, no. 3, p. 378.

Menhaden, 75-130 mm, major food of dogfish.

Bearden, Charles M.

1967. Salt-water impoundments for game fish in South Carolina. Progressive Fish-Culturist, vol. 29, no. 3, p. 123-128.

Atlantic menhaden, B. tyrannus, introduced into salt water ponds for food of red drum, spot, black drum, and Atlantic croaker.

Bearden, Charles M., and C. H. Farmer, III.

1972. Fishery resources of Port Royal Sound estuary, p. 203-212. In Port Royal Sound environmental study. South Carolina Water Resources Commission.

Juvenile Atlantic menhaden collected during trawl sampling.

Beasley, Thomas M.

1969. Studies of the natural alpha-emitting radioisotopes in marine organisms. Laboratory of Radiation Ecology, Annual Progress Report 1969-1970, University of Washington, 7 p.

Radionuclide concentrations in fish protein concentrates from B. tyrannus and B. patronus.

Beezhold, F. Lee, and Virginia F. Stout.

1973. The use and effect of mixed standards on the quantitation of polychlorinated byphenyls. Bulletin Environmental Contamination and Toxicology, vol. 10, no. 1, p. 10-15.

Included are PCB residue content in menhaden meal.

Berg, Leo S.

1955. Classification of fishes both recent and fossil (in Russian). 2nd ed. Trudy Zoologicheskii Institut, Akademia Nauk SSSR, vol. 20, p. 1-286.

Genus Brevoortia included, p. 164.

Berry, Frederick H.

1964. Review and emendation of: Family Clupeidae. Copeia, 1964, no. 4, p. 720-730.

A critical review and up-dating of the family Clupeidae by Samual F. Hildebrand in Fishes of the Western North Atlantic, Sears Foundation for Marine Research. Mentions all the known species of Brevoortia as well as Ethmalosa fimbriata.

Bertmar, Gunnar, B. G. Kapoor, and Robert Victor Miller.

1969. Epibranchial organs in lower teleostean fishes - an example of structural adaptation. International Review of General and Experimental Zoology, vol. 4, p. 1-48.

Comparison of Brevoortia epibranchial organs with those of other clupeid genera.

Blaxter, J. H. S.

1969. Development: Eggs and larvae, p. 177-252. In W. S. Hoar and D. J. Randall [eds.], Fish physiology, vol. 3. Academic Press, New York.

Cites Lewis (1965 and 1966).

Blaxter, J. H. S., and F. G. T. Holliday.

1963. The behaviour and physiology of herring and other clupeids, p. 261-393. In F. S. Russell [ed.], Advances in marine biology, vol. 1. Academic Press, New York.

Incidental references to salinity tolerances and behavior of Brevoortia.

Bogdanov, D. V., V. A. Sokolov, and N. S. Khromov.

1968. Regions of high biological and commercial productivity in the Gulf of Mexico and Caribbean Sea. Oceanology, vol. 8, no. 3, p. 371-381.

B. patronus, Gulf menhaden fishery mentioned.

Böhlke, James E., and Charles C. G. Chaplin.

1968. Fishes of the Bahamas and adjacent tropical waters. Academy of Natural Sciences of Philadelphia. Livingston Publishing Co., Wynnewood, Pa., 771 p.

Menhadens mentioned in discussion of Clupeidae. Not reported from region.

Booke, Henry E.

1964. A review of variations found in fish serum proteins. New York Fish and Game Journal, vol. 11, no. 1, p. 47-57.

Cites previous literature on nitrogen concentration in blood of menhaden.

Brandt, Andres von.

1964. Fish catching methods of the world. Fishing News (Books) Ltd., London, 191 p.

Menhaden fishing by weirs and purse seines mentioned.

Breder, C. M., Jr.

1959. Studies on social groupings in fishes. Bulletin of the American Museum of Natural History, vol. 117, art. 6, p. 397-481.

Cited by Blaxter and Holliday (1963). B. tyrannus feeding behavior, p. 415, and schooling, p. 457.

Breder, Charles M., Jr., and Donn Eric Rosen.

1966. Modes of reproduction in fishes. Natural History Press, Garden City, N.Y., 941 p.

B. tyrannus and B. patronus mentioned.

Briggs, Philip T.

1970. Records of ectoparasitic isopods from Great South Bay, New York. New York Fish and Game Journal, vol. 17, no. 1, p. 55-57.

Cites Alperin (1966). Livonica ovalis reported in menhaden.

Brooks, W. K.

1893. The menhaden, p. 247-251. In Maryland, its resources, industries and institutions. Prepared for the Board of World's Fair Managers of Maryland by members of Johns Hopkins University and others, Baltimore.

Brief general account of menhaden and the menhaden fishery.

Bullis, Harvey R., Jr.

1968. A program to develop aerial phototechnology for assessment of surface fish schools. Proceedings of the Gulf and Caribbean Fisheries Institute, 20th Annual Session, 1967, p. 40-43.

Menhaden fishery and menhaden school movements mentioned.

Bullis, Harvey R., Jr., and James S. Carpenter.

1968. Latent fishery resources of the central west Atlantic region, p. 61-64. In DeWitt Gilbert [ed.], The future of the fishing industry of the United States. University of Washington, Publications in Fisheries, New Series, vol. 4.

Menhaden fishery mentioned. B. patronus mentioned.

Burns, Charles.

1970. Fishes rarely caught in shrimp trawl. Gulf Research Reports, vol. 3, no. 1, p. 110-130.

Only three Gulf menhaden caught in shrimp trawl during study, 1967-69.

Butler, Johnny A.

1961. Development of a thread herring fishery in the Gulf of Mexico. Commercial Fisheries Review, vol. 23, no. 9, p. 12-17.

Gulf menhaden production, 1939-60.

Butler, Johnny A.

1966. Off-season menhaden explorations--Gulf of Mexico (Pascagoula, Miss.), p. 8-15. In Annual Report, Exploratory Fishing and Gear Research, Bureau of Commercial Fisheries, Region 2, for fiscal year 1965. U.S. Fish and Wildlife Service, Circular 249.

An analysis of data from aerial flights and gill-net sampling for B. patronus and B. smithi in the eastern Gulf.

Butler, Philip A.

1968. Pesticides in the estuary, p. 120-124. In John D. Newsom [ed.], Proceedings of the Marsh and Estuary Management Symposium. Thomas J. Moran's Sons, Inc., Baton Rouge.

Menhaden mentioned.

Cahn, Phyllis H., William Siler, and Masaru Fujiya.

1973. Sensory detection of environmental changes by fish, p. 363-387. In Walter Chavin [ed.], Responses of fish to environmental changes. Charles C. Thomas, Springfield, Ill.

Effects of dieldrin on the sensory responses and behavior of B. tyrannus.

Cameron, James N.

1970. Blood characteristics of some marine fishes of the Texas Gulf Coast. Texas Journal of Science, vol. 21, no. 3, p. 255-283.

Blood characteristics of B. patronus.

Carlson, Carl B., and Kenneth P. Foster.

1945. Experimental purse seine fishing for menhaden with the Jeff Davis. U.S. Fish and Wildlife Service, Fishery Market News, vol. 7, no. 5a, p. 1-48.

Detailed report of fishing trials for B. tyrannus off northern Florida.

Carlson, F. T.

1973. Rearing menhaden larvae (Part 1), p. 148. (Abstract). In A. L. Pacheco [ed.], Proceedings of a Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries. National Marine Fisheries Service, Middle Atlantic Coastal Fisheries Center, Technical Publication no. 1.

Methods used to collect larval B. tyrannus for rearing in the laboratory.

Carlson, Frank T., and John W. Reintjes.

1972. Suitability of internal tags for Atlantic menhaden. National Marine Fisheries Service, Fishery Bulletin, vol. 70, no. 2, p. 514-517.

Four types of internal ferromagnetic tags tested with B. tyrannus.

Chambers, Gilbert V., and Albert K. Sparks.

1959. An ecological survey of the Houston Ship Channel and adjacent bays. Publications of the University of Texas, Institute of Marine Science, vol. 6, p. 213-250.

Catch of B. patronus juveniles in trawl during 1958 and a tabulation of the presence or absence of secondary shoulder spots.

Chapman, Charles R.

1966. The Texas basins project, p. 83-92. In A symposium on estuarine fisheries. American Fisheries Society, Special Publication No. 3.

Gulf menhaden, B. patronus, importance of Gulf fishery resources mentioned.

Chapman, Wilbert McLeod.

1964. The theory and practice of the 12-mile fishery limit. Proceedings of the Gulf and Caribbean Fisheries Institute, 16th Annual Session, 1963, p. 9-23.

The possible effect of the 12-mile limit to the menhaden and Ethmalosa fisheries is mentioned.

Chapoton, Robert B.

1967. Scale development in the Gulf menhaden, Brevoortia patronus. Transactions of the American Fisheries Society, vol. 96, no. 1, p. 60-62.

Scale formation begins as a single row on the anterior ventral surface of fish measuring 21-22 mm fork length.

Chapoton, Robert B.

1970. History and status of the Gulf of Mexico's menhaden purse seine fishery. (Abstract). Journal of the Elisha Mitchell Society, vol. 86, no. 4, p. 183-184.

Analysis of catch and effort data to determine the catch-per-unit-of-effort and maximum sustainable yield for Gulf menhaden.

Chapoton, Robert B.

1972. The future of the Gulf menhaden, the United States' largest fishery. Proceedings of the Gulf and Caribbean Fisheries Institute, 24th Annual Session, 1971, p. 134-143.

History and status of the fishery with estimates of maximum sustainable yield, comparison with other U.S. fisheries and future prospects.

Chipman, Walter A.

1959. Accumulation of radioactive materials by fishery organisms. Proceedings of the Gulf and Caribbean Fisheries Institute, 11th Annual Session, 1958, p. 97-110.

Ruthenium-106 uptake in menhaden, B. tyrannus, fed labeled phytoplankton.

Christensen, Robert Frank.

1965. An ichthyological survey of Jupiter Inlet and Loxahatchee River, Florida. M.S. thesis, Florida State University, Tallahassee, Fla. 318 p.

B. smithi and B. tyrannus listed.

Ciechomski, Juana D. de.

1968. Huevos y larvas de tres especies de peces marinos, Anchoa marinii, Brevoortia aurea y Prinontus nudigula de la zone de Mar del Plata. Boletin del Instituto de Biologia Marina, Argentina, p. 1-28.

Description of egg and yolk-sac larva of B. aurea.

Clark, John.

1966. Why salt water fishes need the shallow coastal estuaries, p. 25-34. In Proceedings, Symposium on Estuarine Ecology, Coastal Waters of North Carolina. Water Resources Research Institute, Raleigh.

Menhaden included among estuarine dependent fishes.

Clark, John.

1967. Fish and man - Conflict in the Atlantic estuaries. American Littoral Society, Special Publication No. 5, 78 p.

Menhaden fishery production and their use of estuaries for nurseries briefly mentioned.

Clark, John, and Willard N. Brownell.

1973. Electric power plants in the coastal zone: Environmental issues. American Littoral Society, Special Publication no. 7, 146 p.

Menhaden, an abundant and common estuarine fish, frequently is impinged on intake structures, entrained in cooling water, and killed by cold shock when power plant shuts down during the winter.

Clark, J. R., and S. E. Smith.

1969. Migratory fish of the Hudson River, p. 293-319. In G. P. Howells and G. J. Lauer [eds.], Hudson River ecology. New York University, New York.

Occurrence of young Atlantic menhaden.

Clark, John, W. G. Smith, Arthur W. Kendall, Jr., and Michael P. Fahay.

1969. Studies of estuarine dependence of Atlantic coastal fishes. U.S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife, Technical Papers 28, 132 p.

B. tyrannus larvae, juveniles, and adults collected by midwater trawl.

Cobb, Bryant F., III, Lucy Carter, and Virgil L. Koenig.

1968. The distribution of the soluble protein components in the crystalline lenses of fishes. Comparative Biochemistry and Physiology, vol. 24, no. 3, p. 817-826.

B. gunteri included.

Coburn, C. B., Jr., and Barbara A. Fischer.

1973. Red blood cell hematology of fishes: A critique of techniques and compilation of published data. Journal of Marine Science (Alabama), vol. 2, no. 2, p. 37-58.

Includes Brevoortia tyrannus.

Cocoros, Glenn E.

1971. Mercury contamination of plankton feeding fish: Experimental studies on the Atlantic menhaden, Brevoortia tyrannus. M.S. thesis, Long Island University, New York, 42 p.

Mercury content in Atlantic menhaden compared to mercury content of water and plankton. Mercury concentration in menhaden ranged from 0.049-0.189 ppm, well below the 0.50 ppm tolerance limit.

Cocoros, Glenn, Phyllis H. Cahn, and William Siler.

1973. Mercury concentrations in fish, plankton and water from three Western Atlantic estuaries. Journal of Fish Biology, vol. 5, no. 6, p. 641-647.

Mercury concentrations in B. tryannus were 0.3 to 0.6 ppm dry weight, about twice that for the plankton on which they feed.

Collins, J. W.

1883. Report upon a cruise made to the tilefish ground in the smack "Josie Reeves," September, 1882. Bulletin of the U.S. Fish Commission, vol. 2, p. 301-310.

Procuring menhaden for fish bait. Several comments about fishery.

Collins, J. W.

1884. A search for mackerel off Block Island, Montauk, and Sandy Hook, in November, 1883. Bulletin of the U.S. Fish Commission, vol. 4, p. 49-51.

Menhaden used for mackerel bait.

Colton, John B., Jr., and Robert R. Marak.

1969. Guide for identifying the common planktonic fish eggs and larvae of Continental Shelf waters, Cape Sable to Block Island. U.S. Bureau of Commercial Fisheries Biological Laboratory, Woods Hole, Mass., Laboratory Reference no. 69-9, 72 p.

Brief description of B. tyrannus eggs and larvae with figures of 4.5-, 5.7-, 9.0-, and 23-mm larvae.

Combs, Ralph M.

1969. Embryogenesis, histology and organology of the ovary of Brevoortia patronus. Gulf Research Reports, vol. 2, no. 4, p. 333-434.

A detailed study with illustrations of the subject.

Commercial Fisheries Review.

1963. Menhaden. Commercial Fisheries Review, vol. 25, no. 2, p. 36-37.

B. patronus occur throughout the year in Alabama, Mississippi and Louisiana coastal waters. Length frequency data listed.

Commercial Fisheries Review.

1967. Bureau of Commercial Fisheries programs. "Bowers" uses lights and recorders. Commercial Fisheries Review, vol. 29, no. 89, p. 23.

First-year-class menhaden, B. patronus, were attracted at night to artificial white lights in the Gulf of Mexico.

Compton, Henry.

1965. A survey of fish populations in the inshore Gulf of Mexico off Texas, p. 55-86. In Texas Parks and Wildlife Department. Coastal Fisheries Project Reports, 1965.

B. patronus and B. gunteri mentioned.

Cooper, Richard Arthur.

1965. An unusually large menhaden, Brevoortia tyrannus (Latrobe), from Rhode Island. Transactions of the American Fisheries Society, vol. 94, no. 4, p. 412.

Largest known specimen measuring 470 mm in total length and weighing 1,674 g.

Copeland, B. J.

1965. Fauna of the Aransas Pass Inlet, Texas. I. Emigration as shown by tide trap collections. Publications of the University of Texas, Institute of Marine Science, vol. 10, p. 9-21.

B. patronus was captured from November through May. Peak emigration was observed in November and March through May.

Coston, Linda C.

1971. Summary of tags released and recovered for the Atlantic menhaden, 1966-69. National Marine Fisheries Service, Data Report 66, 117 p.

Results of ferromagnetic internal tagging of B. tyrannus.

Crance, Johnie H.

1969. A selected bibliography of Alabama estuaries. Alabama Marine Resources Laboratory, Marine Resources Bulletin, no. 2, 21 p.

Includes references to menhaden.

Crance, Johnie H.

1971. Description of Alabama estuarine areas--cooperative Gulf of Mexico estuarine inventory. Alabama Marine Resources Laboratory, Marine Resources Bulletin, no. 6, 85 p.

Menhaden included as one of the principal fish species. General reference, no data.

Crittenden, Edward.

1958. A pre-impoundment fishery study of North Bay and associated waters, Bay County, Florida. Proceedings of the 11th Annual Conference, Southeastern Association of Game and Fish Commissioners, 1957, p. 211-219.

Number and weight of B. smithi in collections of fish by gill nets, rotenone, and explosives.

Croker, Robert A.

1965. Planktonic fish eggs and larvae of Sandy Hook Estuary. Chesapeake Science, vol. 6, no. 2, p. 92-95.

The seasonal collection of 258 B. tyrannus eggs during May and June and 5 larvae during November and December.

Cromer, Paul L.

1969. Fish and pollution: Experimental studies on the Atlantic menhaden, Brevoortia tyrannus. M.S. thesis, Long Island University, New York, 61 p.

Juvenile Atlantic menhaden, maintained experimentally in tanks, contained dieldrin in their tissues. Studies did not determine the lethal effects of naturally occurring dieldrin.

Cronin, L. Eugene.

1968. The protection of Maryland's estuarine areas. Proceedings of the Gulf and Caribbean Fisheries Institute, 20th Annual Session, 1967, p. 44-54.

Menhaden mentioned.

Cross, Ford A., and Jeraldine H. Brooks.

1973. Concentrations of manganese, iron and zinc in juveniles of five estuarine-dependent fishes, p. 769-775. In D. J. Nelson [ed.], Radionuclides in ecosystems. Proceedings of the Third National Symposium on Radioecology, U.S. Atomic Energy Commission, Oak Ridge, Tennessee.

Concentrations of Fe and Zn decreased with body weight and Mn increased with body weight in Atlantic menhaden.

Culley, Michael.

1971. The pilchard - Biology and exploitation. Pergamon Press, New York, 241 p.

Menhaden reduction industry mentioned.

Dahlberg, Michael D.

1966. A systematic review of the North American species of menhaden, genus Brevoortia. Ph.D. thesis, Tulane University, New Orleans, 161 p. (Dissertation Abstracts International, vol. 27, p. 1651-B).

A key to menhaden species and hybrids, describes the various forms, presents synonymies and recent references, and discusses hybridization, geographic variation, population structure, comparative lipid analysis, condition factors, and fish meal indexes. Published in part Dahlberg (1970a).

Dahlberg, Michael D.

1969a. Fat cycles and condition factors of two species of menhaden, Brevoortia (Clupeidae), and natural hybrids from the Indian River of Florida. American Midland Naturalist, vol. 82, no. 1, p. 117-126.

Dahlberg, Michael D.

1969b. Incidence of the isopod, Olencira praegustator, and copepod, Lernaeenicus radiatus, in three species and hybrid menhaden (Brevoortia) from the Florida coasts, with five new host records. Transactions of the American Fisheries Society, vol. 98, no. 1, p. 111-115.

Monthly incidence of the two parasites from B. tyrannus, B. patronus, B. smithi and hybrids B. tyrannus X B. smithi and B. patronus X B. smithi from the Atlantic and Gulf coasts of Florida.

Dahlberg, Michael D.

1970a. Atlantic and Gulf of Mexico menhadens, genus Brevoortia (Pisces: Clupeidae). Bulletin of the Florida State Museum, Biological Sciences, vol. 15, no. 3, p. 91-162.

A key to menhaden species and hybrids, describes the various forms, presents synonymies and recent references, and discusses hybridization, geographic variation, population structure, and zoogeography.

Dahlberg, Michael D.

1970b. Frequencies of abnormalities in Georgia estuarine fishes. Transactions of the American Fisheries Society, vol. 99, no. 1, p. 95-97.

Pughead B. tyrannus reported from northeast Florida. One injured B. tyrannus among 414 examined.

Dahlberg, Michael D.

1972. An ecological study of Georgia coastal fishes. National Marine Fisheries Service, Fishery Bulletin, vol. 70, no. 2, p. 323-353.

B. tyrannus and B. smithi occurrences with hybrids.

Dahlberg, Michael D., and Eugene P. Odum.

1970. Annual cycles of species occurrence, abundance, and diversity in Georgia estuarine fish populations. American Midland Naturalist, vol. 83, no. 2, p. 382-392.

Monthly occurrence of B. tyrannus in trawl collections from Sapelo and St. Catherine's Sounds.

Daiber, Franklin C.

1963. Tidal creeks and fish eggs, role of tidal flow, salinity, and light in distribution of fish eggs and larvae. Estuarine Bulletin, vol. 7, nos. 2-3, p. 6-14.

Mentions menhaden on page 7.

Davis, Jackson.

1970. Exploring for schooling pelagic fishes in Middle Atlantic Bight. Commercial Fisheries Review, vol. 32, no. 3, p. 23-24.

Menhaden fishing technique used in landing schooling fish.

Dawson, C. E.

1964. A bibliography of anomalies of fishes. Gulf Research Reports, vol. 1, no. 6, p. 308-399.

B. patronus, cites Gunter and Ward (1961).

Dawson, C. E.

1966. A bibliography of anomalies of fishes. Supplement 1. Gulf Research Reports, vol. 2, no. 2, p. 169-176.

Listed Schwartz (1965).

Dawson, C. E.

1971. A bibliography of anomalies of fishes. Supplement 2. Gulf Research Reports, vol. 3, no. 2, p. 215-239.

Cites menhaden anomalies by Dahlberg (1970b), Lewis (1966), Musick and Hoff (1968) and Warlen (1969).

Day, John W., Jr.,William G. Smith, and Charles S. Hopkinson, Jr.

1973. Some trophic relationships of marsh and estuarine areas, p. 115-135. In R. H. Chabreck [ed.], Proceedings of the Coastal Marsh and Estuary Management Symposium, Louisiana State University.

Menhaden listed among the lower trophic level fishes.

Day, John, W., Jr., William G. Smith, Paul R. Wagner, and Wilmer C. Stowe.

1973. Community structure and carbon budget of a salt marsh and shallow bay estuarine system in Louisiana. Louisiana State University, Publ., LSU-SG-72-04, 79 p.

B. patronus listed among herbivores.

De Buen, Fernando.

1966. Resultados de una campana ictiologica en las provincias del Norte. Universidad de Chile, Estudios Oceanologicos, vol. 2, p. 5-9.

B. (Ethmidium) maculata and B. (Ethmidium) chilcae listed.

Derickson, W. Kenneth, and Kent S. Price, Jr.

1973. The fishes of the shore zone of Rehoboth and Indian River bays, Delaware. Transactions of the American Fisheries Society, vol. 102, no. 3, p. 553-562.

Atlantic menhaden among fishes reported.

de Sylva, Donald P.

1959. Marshes, menhaden and marlin. Delaware Conservationist, vol. 3, no. 3, p. 7, 10-11.

Destruction of marshes threaten habitat of young menhaden.

de Sylva, Donald P.

1969. Theoretical considerations of the effects of heated effluents on marine fishes, p. 229-293. In Peter A. Krenkel and Frank L. Parker [eds.], Biological aspects of thermal pollution. Vanderbilt University Press, Nashville.

Cites Lewis (1966).

DiCapua, Richard A.

1966. On the application of immunological techniques in geographic group studies of Atlantic sea herring, Clupea harengus. I. Neutralization of immune precipitins as an aid to herring serum analysis by immunoelectrophoresis. Journal of Experimental Zoology, vol. 162, no. 1, p. 1-13.

Mairs and Sindermann (1962) report on relationship of clupeids, including Alosa, Brevoortia and Clupea. No menhaden reported among the results.

DiCapua, Richard A.

1969. On the application of immunological techniques in geographic group studies of Atlantic sea herring, Clupea harengus. II. Herring serum analysis by gel diffusion. Journal of Experimental Zoology, vol. 172, no. 1, p. 11-24.

Results agreed with Mairs and Sindermann (1962) in the relationship of Alosa, Brevoortia, and Clupea. Atlantic menhaden, B. tyrannus, used in the study.

Domanevskii, L. M., and V. A. Rikhter.

1968. Key to families of principal commercial fish of the Northwest Atlantic and description of species. Fisheries Research Board of Canada, Translation Series no. 1128, 54 p.

B. tyrannus included.

Dovel, William.

1967. Fish eggs and larvae of the Magothy River, Maryland. Chesapeake Science, vol. 8, no. 2, p. 125-129.

B. tyrannus was collected only once during a period of 15 months.

Dovel, William L.

1968. Predation by striped bass as a possible influence on population size of the Atlantic croaker. Transactions of the American Fisheries Society, vol. 97, no. 4, p. 313-319.

B. tyrannus listed as a principal food of striped bass.

Dovel, William L.

1971. Fish eggs and larvae of the upper Chesapeake Bay. Natural Resources Institute, University of Maryland, Special Report no. 4, 71 p.

Menhaden eggs collected in spring and fall at Solomons, Md., temperature range 13-20°C, salinity 10-22 ppt. Young menhaden appeared in upper estuarine areas from late March to late June.

Dragovich, Alexander.

1969. Review of studies of tuna food in the Atlantic Ocean. U.S. Fish and Wildlife Service, Special Scientific Report - Fisheries no. 593, 21 p.

B. tyrannus reported as food of Thunnus atlanticus.

Dryfoos, Robert L., Randall P. Cheek, and Richard L. Kroger.

1973. Preliminary analyses of Atlantic menhaden, Brevoortia tyrannus, migrations, population structure, survival and exploitation rates and availability as indicated from tag returns. National Marine Fisheries Service, Fishery Bulletin, vol. 71, no. 3, p. 719-734.

From over 200,000 recoveries of more than 1 million tagged Atlantic menhaden, estimates of survival, exploitation and mortality rates were made.

Duke, Thomas W., John P. Baptist, and Donald E. Hoss.

1966. Bioaccumulation of radioactive gold used as a sediment tracer in the estuarine environment. U.S. Fish and Wildlife Service, Fishery Bulletin, vol. 65, no. 2, p. 427-436.

B. tyrannus mentioned among fish collected in the test area.

Dunbar, Gary S.

1958. Historical geography of the North Carolina Outer Banks. Louisiana State University Studies, Coastal Studies Series no. 3, 234 p.

Early account of menhaden fishing in North Carolina.

Dunham, Fred.

1972. A study of commercially important estuarine-dependent industrial fishes. Louisiana Wild Life and Fisheries Commission, Technical Bulletin No. 4, 63 p.

Distribution and abundance of Gulf menhaden, B. patronus, samples from a trawl survey July 1969 to June 1972. Occurrence of fishes other than menhaden in purse-seine landings by sampling during 1971-72.

Ehrlich, Paul R., and Anne H. Ehrlich.

1970. Population, resources, environment: Issues in human ecology. W. H. Freeman Co., San Francisco. 383 p.

Menhaden over exploited.

Eisler, Ronald.

1965. Erythrocyte counts and hemoglobin content in nine species of marine teleosts. Chesapeake Science, vol. 6, no. 2, p. 119-120.

B. tyrannus has a hemoglobin value of 12.3 g/100 ml of blood.

Evermann, B. W., and W. C. Kendall.

1900. Check-list of the fishes of Florida. U.S. Commissioner of Fish and Fisheries, Report for 1899, p. 37-103.

B. tyrannus listed p. 56.

Fahy, William E.

1966. Species composition of the North Carolina industrial fish fishery. Commercial Fisheries Review, vol. 28, no. 7, p. 1-8.

Menhaden composed 42.9 percent by weight of trash fish caught in long-haul and pound-net fishery.

Fairbanks, Randall B., W. Stephen Collings, and Wendell T. Sides.

1971. An assessment of the effects of electrical power generation on marine resources in the Cape Cod Canal. Massachusetts Department of Natural Resources, Division of Marine Fisheries, 48 p.

Juvenile Atlantic menhaden among fish killed by chlorine biocide and heated water near the effluent plume of the Canal Electric Company plant.

Finucane, John H.

1969a. Antimycin as a toxicant in a marine habitat. Transactions of the American Fisheries Society, vol. 98, no. 2, p. 288-292.

B. smithi included in a list of fishes experimentally killed by Antimycin A.

Finucane, John H.

1969b. Faunal production report, p. 11-15. In Report of the Bureau of Commercial Fisheries Biological Laboratory, St. Petersburg Beach, Florida, fiscal year 1968. U.S. Fish and Wildlife Service, Circular 313.

B. smithi included in a list of fishes experimentally killed by Antimycin A.

Foehrenbach, Jack.

1972. Chlorinated pesticides in estuarine organisms. Journal of the Water Pollution Control Federation, vol. 44, no. 4, p. 619-624.

B. tyrannus included in analyses.

Fontenot, Bennie J., Jr., and Howard E. Rogillio.

1970. A study of estuarine sportfishes in the Biloxi marsh complex, Louisiana. Louisiana Wild Life and Fisheries Commission, Dingell-Johnson Project, Completion report F-8, 172 p.

Gulf menhaden mentioned.

Fore, Paul L.

1971. The distribution of eggs and larvae of the round herring, Etrumeus teres, in the northern Gulf of Mexico. (Abstract). ASB (Association of Southeastern Biologists) Bulletin, vol. 18, no. 2, p. 34.

Gulf menhaden eggs were the most abundant pelagic fish eggs from October to March.

Fore, Paul L., and Kenneth N. Baxter.

1972a. Collections of larval Gulf menhaden, B. patronus, from Galveston Entrance (1959-1969) and Sabine Pass (1963-1967), Texas. National Marine Fisheries Service, Data Report 74, 17 p.

Results of regular sampling of two Texas inlets for larval Gulf menhaden.

Fore, Paul L., and Kenneth N. Baxter.

1972b. Diel fluctuations in the catch of larval Gulf menhaden, B. patronus, at Galveston Entrance, Texas. Transactions of the American Fisheries Society, vol. 101, no. 4, p. 729-732.

Catches of larval Gulf menhaden made in a series of collections during a 96-hour period at the inlet to Galveston Bay and the relation of these catches to tidal currents.

Forste, Robert H.

1964. Industry trends and indicators of economic performance in the menhaden fishery. Proceedings of the Gulf and Caribbean Fisheries Institute, 16th Annual Session, 1963, p. 30-46.

Economic elements underlying the growing relative importance of the Gulf menhaden fishery and the degree the Atlantic and Gulf fisheries fulfill basic economic objectives of performance.

Franklin, Lynn.

1972. Menhaden fishing. Oceans Magazine, vol. 3, no. 2, p. 65-73.

Popular description with numerous photographs.

Fuss, Charles M., Jr.

1968. A new thread herring fishery in eastern Gulf of Mexico. Commercial Fisheries Review, vol. 30, no. 6, p. 36-41.

Menhaden fishery mentioned.

Fuss, Charles M., Jr., John A. Kelly, Jr., and Kenneth W. Prest, Jr.

1969. Gulf thread herring: Aspects of the developing fishery and biological research. Proceedings of the Gulf and Caribbean Fisheries Institute, 21st Annual Session, 1968, p. 111-125.

Menhaden fishery compared to developing thread herring fishery.

General Dynamics -Electric Boat Division.

1971. Potential environmental effects of an offshore submerged nuclear power plant. Environmental Protection Agency, Water Pollution Control Research, GFI 06/71, vol. 1, 325 p.; vol. 2, 285 p.

B. tyrannus included and listed in thermal tolerance table.

Godwin, Walter F., and Thomas L. Vaughn.

1968. An adult pugheaded American shad Alosa sapidissima. Transactions of the American Fisheries Society, vol. 97, no. 1, p. 50.

Cites Schwartz (1964-1965) reference to B. tyrannus.

Goldmintz, Daniel, and Joseph C. Hull.

1970. Bacterological aspects of fish protein concentrate production, p. 335-340. In Cyril J. Corum [ed.], Developments in industrial microbiology, vol. 11. American Institute of Biological Sciences, Washington, D.C.

Raw menhaden, B. tyrannus, had higher bacterial counts than hake, Urophycis chuss, but fish protein concentrate counts were similar.

Goodyear, C. Phillip.

1967. Feeding habits of three species of gars, Lepisosteus, along the Mississippi Gulf Coast. Transactions of the American Fisheries Society, vol. 96, no. 3, p. 297-300.

Longnose gar fed primarily at night on B. patronus juveniles in Mississippi estuaries.

Gordon, Bernard L.

1958. The bountiful menhaden. Nature Magazine, vol. 51, no. 6, p. 322-323, 332.

Popular, general account of Atlantic menhaden, B. tyrannus.

Gowanloch, James Nelson.

1950. New developments in the menhaden industry. Proceedings of the Gulf and Caribbean Fisheries Institute, 2nd Annual Session, 1949, p. 39-40.

General review of Gulf menhaden purse-seine fishery.

Graham, Herbert W.

1968. Trends in the marine fisheries of the Continental Shelf of the eastern United States. Transactions of the American Fisheries Society, vol. 97, no. 1, p. 77-82.

Brief report on menhaden landings with graph showing landings by region, 1930-66.

Green, J.

1968. The biology of estuarine animals. University of Washington Press, Seattle, 401 p.

The importance of Brevoortia to estuarine food web is mentioned.

Gregg, S. Alexander, Jr.

1968. The fisheries of North Carolina. M.S. thesis, University of North Carolina, Chapel Hill, 90 p.

Menhaden fishery and industry described, fishery statistics listed.

Gunter, Gordon.

1964. The Gulf of Mexico fishery in relation to the sport fisheries. Proceedings of the Gulf and Caribbean Fisheries Institute, 16th Annual Session, 1963, p. 99-108.

The author refutes the claims of sport fishermen that the menhaden purse-seine fishery is harmful to the recreational fish populations.

Gunter, Gordon.

1967. Some relationships of estuaries to the fisheries of the Gulf of Mexico, p. 621-638. In George H. Lauff [ed.], Estuaries. American Association for the Advancement of Science, Publication no. 82, Washington, D.C.

Discussion of the commercial menhaden fishery in the Gulf, and the relationships of young menhaden to estuaries.

Gunter, G.

1969. Fisheries in coastal lagoons, p. 663-670. In Agustin Ayala Castanares and Fred B. Phleger [eds.], Coastal lagoons, a symposium. Universidad Nacional Autonoma de Mexico, Cuidad Universitaria.

Gulf menhaden fishery mentioned.

Gunter, Gordon, and Gordon E. Hall.

1963. Biological investigations of the St. Lucie estuary (Florida) in connection with Lake Okeechobee discharges through the St. Lucie Canal. Gulf Research Reports, vol. 1, no. 5, p. 189-307.

Catch records of B. tyrannus and B. smithi listed in table 24.

Gunter, Gordon, and J. W. Ward.

1961. Some fishes that survive extreme injuries, and some aspects of tenacity of life. Copeia, 1961, no. 4, p. 456-462.

Gulf menhaden, B. patronus, included.

Gusev, E. E.

1964. Some peculiarities in menhaden morphology, Brevoortia tyrannus (Latrobe). Contributions to Commercial Fisheries Research of the Artic Basin, N. M. Knipovicha Institute (PINRO), no. 2, p. 13-16. Trans. J.M. Moulton, Bowdoin College, Brunswick, Me.

Discussion of filter feeding of menhaden with description of intestinal tract structure.

Hall, F. G.

1928. Blood concentration in marine fishes. Journal of Biological Chemistry, vol. 76, p. 623-631.

Increased concentration of blood elements of B. tyrannus during asphyxiation followed by a weight loss of the spleen.

Harder, Wilhelm.

1964. Anatomie der Fische, vol. 2A. E. Schweizerbart'sche Verlagsbuchhandlung, Stuttgart, 308 p.

Alimentary tract of Brevoortia mentioned.

Hatton, S. R., and G. R. Smalley.

1938. Reduction process for sardines in California. California Fish and Game, vol. 24, no. 4, p. 391-414.

Menhaden fishery mentioned.

Hays, H., and R. W. Risebrough.

1972. Pollutant concentrations in abnormal young terns from Long Island Sound. Auk, vol. 89, no. 1, p. 19-35.

Concentrations of DDT and PCB compounds and mercury in Atlantic menhaden.

Heald, Eric J.

1968. Atlas of the principal fishery resources on the Continental Shelf from New York to Florida. Prepared for the E. I. du Pont de Nemours Company, University of Miami, Institute of Marine Sciences, 225 p.

Brief account of fishery by regions along the Atlantic Coast with three charts for menhaden. B. tyrannus discussed and B. smithi listed.

Heald, Eric J., and Raymond C. Griffiths.

1967. The age determination, from scale readings, of the sardine, Sardinella anchovia, of the Gulf of Cariaco, Eastern Venezuela. Venezuela Ministerio de Agricultura y Cria, Investigaciones Pesqueras, Serie Recursos y Explotacion Pesqueras, vol. 1, no. 10, p. 375-446.

Mentions aging of B. tyrannus.

Hela, Ilmo.

1967. Meritieteen tehtavista. Merentutkimuslaitoksen Julkaisu Havsforskningsinstitutets Skrift, no. 222, 55 p.

B. tyrannus and menhaden fishery mentioned.

Henry, Kenneth A.

1965. Biological investigations of purse seine fishery for Atlantic menhaden. U.S. Fish and Wildlife Service, Special Scientific Report - Fisheries no. 519, 12 p.

Compilation of fishery statistics.

Henry, Kenneth A.

1968. Exploitation and biological research of Atlantic menhaden, p. 265-273. In Transactions of the National Symposium on Ocean Sciences and Engineering of the Atlantic Shelf. Marine Technology Society, Washington, D. C.

General account of menhaden studies.

Henry, Kenneth A.

1969. Menhaden fisheries, p. 393-398. In Frank E. Firth [ed.], The encyclopedia of marine resources. Van Nostrand Reinhold Co., New York.

General account of the menhaden fishery with landings, 1942-66.

Henry, Kenneth A.

1971. Atlantic menhaden (Brevoortia tyrannus) resource and fishery - analysis of decline. National Marine Fisheries Service, Special Scientific Report - Fisheries 642, 32 p.

Analysis of age and size, fishing effort, catch and population dynamics of the Atlantic menhaden resource, 1955-68.

Henry, Kenneth A., Edwin B. Joseph, Charles M. Bearden, and John W. Reintjes.

1965. Atlantic menhaden...a most abundant fish. Atlantic States Marine Fisheries Commission, Leaflet no. 2, 4 p.

Popular general account.

Henry, Kenneth A., Joseph H. Kutkuhn, and Staff.

1968. Report of the Bureau of Commercial Fisheries Biological Laboratory, Beaufort, N.C., for the fiscal year ending June 30, 1967. U.S. Fish and Wildlife Service, Circular 287, 22 p.

An annual review of menhaden research including development and oceanic distribution of larval menhaden, response of young menhaden to environmental changes, abundance of young-of-the-year menhaden, and population dynamics of Atlantic and Gulf resources by sampling catch and mark-recapture methods.

Henry, Kenneth A., Joseph H. Kutkuhn, and Staff.

1970a. Report of the Bureau of Commercial Fisheries Biological Laboratory, Beaufort, N.C., for the fiscal year ending June 30, 1968. U.S. Fish and Wildlife Service, Circular 341, 24 p.

An annual review of menhaden research including menhaden life history and biology, menhaden population dynamics, and menhaden tagging.

Henry, Kenneth A., Joseph H. Kutkuhn, and Staff.

1970b. Research in fiscal year 1969 at the Bureau of Commercial Fisheries Laboratory, Beaufort, N.C. U.S. Fish and Wildlife Service, Circular 350, 49 p.

An annual review of menhaden research including life history of Atlantic and Gulf menhaden, estimation of larval and juvenile abundance, rearing menhaden, schooling and migratory behavior, tagging and population dynamics of Atlantic and Gulf menhaden.

Henry, Kenneth A., and Staff.

1965. Annual report of the Bureau of Commercial Fisheries Biological Laboratory, Beaufort, N.C., for the fiscal year ending June 30, 1964. U.S. Fish and Wildlife Service, Circular 215, 27 p.

An annual review of menhaden research including sampling of the Atlantic and Gulf fishery, morphology and population studies, estimation of juvenile abundance and estuarine biology of young menhaden.

Henry, Kenneth A., and Staff.

1966. Annual report of the Bureau of Commercial Fisheries Biological Laboratory, Beaufort, N.C., for the fiscal year ending June 30, 1965. U.S. Fish and Wildlife Service, Circular 240, 39 p.

An annual review of menhaden research including classification and distribution of North American menhadens, estuarine survival of young menhaden, abundance of juvenile menhaden, structure and biology of Gulf menhaden stocks and population dynamics of Atlantic and Gulf menhaden.

Henry, Kenneth A., and Staff.

1967. Report of the Bureau of Commercial Fisheries Biological Laboratory, Beaufort, N.C., for the fiscal year ending June 30, 1966. U.S. Fish and Wildlife Service, Circular 264, 30 p.

An annual review of menhaden research including classification and distribution of North American menhaden, response of juvenile menhaden to temperature and salinity, abundance of young menhaden, biology of Gulf of Mexico menhaden and sampling the Atlantic and Gulf purse-seine fisheries.

Herke, William H.

1968. Weirs, potholes and fishery management, p. 193-211. In John D. Newsom [ed.], Proceedings of the Marsh and Estuary Management Symposium. Thomas J. Moran's Sons, Inc., Baton Rouge.

Menhaden catches at Grand Bayou, Louisiana, with surface trawl and weir. Catches with trawl from January through June at 10 sites.

Herke, William H.

1969. A boat-mounted surface push-trawl for sampling juveniles in tidal marshes. Progressive Fish-Culturist, vol. 31, no. 3, p. 177-179.

Menhaden, Brevoortia sp., caught with push-trawl.

Herke, William H.

1971. Use of natural, and semi-impounded Louisiana tidal marshes as nurseries for fishes and crustaceans. Ph.D. thesis, Louisiana State University, 242 p. (Dissertation Abstracts International, vol. 32, p. 2654-B).

B. patronus is one of the principal species. Monthly length frequencies of menhaden from two tidal marshes with observations on size and seasonal distribution with salinity changes.

Hess, Paul W.

1961. Food habits of two dasyatid rays in Delaware Bay. Copeia, 1961, no. 2, p. 239-241.

B. tyrannus included in the food of rays.

Hettler, William F., Jr.

1968. Artificial fertilization among yellowfin and Gulf menhaden (Brevoortia) and their hybrid. Transactions of the American Fisheries Society, vol. 97, no. 2, p. 119-123.

Eggs of B. smithi were fertilized with sperm from B. smithi, B. patronus, and hybrids of the two species. Resulting larvae reared through the yolk-sac stage.

Hettler, William F., Jr.

1970. Rearing larvae of yellowfin menhaden, Brevoortia smithi. Copeia, 1970, no. 4, p. 775-776.

Ova and sperm were obtained from sexually mature B. smithi and were hatched and reared. The last larva, 14.9 mm T.L. survived 32 days.

Hettler, William F., Jr.

1971. A yellowfin menhaden without pelvic fins. Quarterly Journal of the Florida Academy of Sciences, vol. 34, no. 1, p. 63-66.

Adult B. smithi with no pelvic fins and no scar to indicate that they had been lost accidentally. X-ray examination did not show any structural remnants.

Hettler, William F., Jr.

1973. Rearing menhaden larvae (Part 2), p. 149-157. In A. L. Pacheco (ed.), Proceedings of a Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries. National Marine Fisheries Service, Middle Atlantic Coastal Fisheries Center, Technical Publication no. 1.

Methods used to rear larval B. smithi in the laboratory from fertilized eggs.

Hettler, William F., Jr., Richard W. Lichtenheld, and Herbert R. Gordy.

1971. Open seawater system with controlled temperature and salinity. Progressive Fish-Culturist, vol. 33, no. 1, p. 3-11.

Seawater system designed to rear Atlantic menhaden.

Higham, Joseph R., and William R. Nicholson.

1964. Sexual maturation and spawning of Atlantic menhaden. U.S. Fish and Wildlife Service, Fishery Bulletin, vol. 63, no. 2, p. 255-271.

Sexual development and incidence of spawning is based on examination of ovaries collected along Atlantic Coast from 1956-59.

Hildebrand, Samuel F.

1963. Family Clupeidae, p. 257-454. In Fishes of the Western North Atlantic. Sears Foundation for Marine Research, Memoir 1, part 3.

A taxonomic treatment of the genus Brevoortia with detailed description of B. tyrannus, B. patronus, and B. smithi. Although included, B. brevicaudata is no longer considered a valid species.

Hoese, H. Dickson.

1962. Sharks and rays of Virginia's seaside bays. Chesapeake Science, vol. 3, no. 3, p. 166-172.

Menhaden, Brevoortia, used for shark bait.

Hoese, Hinton Dickson.

1965. Spawning of marine fishes in the Port Aransas, Texas, area as determined by the distribution of young and larvae. Ph.D. thesis, University of Texas, 144 p. (Dissertation Abstracts, vol. 26, p. 7507).

Abundance and occurrence of B. patronus and B. gunteri in samples are discussed.

Hoese, H. D., B. J. Copeland, Frank N. Moseley, and E. D. Lane.

1968. Fauna of the Aransas Pass Inlet, Texas. III. Diel and seasonal variations in trawlable organisms of the adjacent area. Texas Journal of Science, vol. 20, no. 1, p. 33-60.

B. patronus among species measured.

Hoff, James G.

1970. Vertebral anomalies in a humpbacked specimen of Atlantic silverside, Menidia menidia. Chesapeake Science, vol. 11, no. 1, p. 64-65.

B. tyrannus mentioned; reference to Musick and Hoff (1968).

Holland, H. Tom, David L. Coppage, and Philip A. Butler.

1967. Use of fish brain acetylcholinesterase to monitor pollution by organophosphorus pesticides. Bulletin of Environmental Contamination & Toxicology, vol. 2, no. 3, p. 156-162.

B. tyrannus mentioned on p. 159, cites Williams and and Sova (1966).

Holliday, F. G. T.

1969. The effects of salinity on the eggs and larvae of teleosts, p. 293-311. In W. S. Hoar and D. J. Randall [eds.], Fish physiology, vol. 1, Excretion, ionic regulation, and metabolism. Academic Press, New York.

Cites Lewis (1966).

Holmes, W. N., and Edward M. Donaldson.

1969. The body compartments and the distribution of electrolytes, p. 189. In W. S. Hoar and D. J. Randall [eds.], Fish physiology, vol. 1, Excretion, ionic regulation, and metabolism. Academic Press, New York.

Cites Sulya, Box and Gunter (1960).

Hopkins, S. H.

1973. Annotated bibliography on effects of salinity and salinity changes on life in coastal waters. Department of Biology, Research Foundation, Texas A & M University. (Contract Report H-73-2, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Miss), 411 p.

Menhaden mentioned.

Hoss, Donald E., and John P. Baptist.

1973. Accumulation of soluble and particulate radionuclides by estuarine fish, p. 776-782. In D. J. Nelson [ed.], Radionuclides in ecosystems. Proceedings of the Third National Symposium on Radioecology, U.S. Atomic Energy Commission, Oak Ridge, Tenn.

Experimental accumulation of cesium-144 by B. tyrannus was principally by surface adsorption rather than by assimilation into the tissues.

Hoss, Donald E., Linda C. Coston, and William F. Hettler, Jr.

1972. Effects of increased temperature on postlarval and juvenile estuarine fish. Proceedings of the 25th Annual Conference, Southeastern Association of Game and Fish Commissioners, 1971, p. 635-642.

Young Atlantic menhaden, B. tyrannus, were exposed to increased temperatures and the effects were measured by the critical thermal maximum, changes in oxygen consumption and survival after exposure to sudden increases in temperature for various periods of time.

Houde, Edward D.

1973. Estimating abundance of sardine-like fishes from egg and larval surveys, eastern Gulf of Mexico: Preliminary report. Proceedings of the Gulf and Caribbean Fisheries Institute, 27th Annual Session, 1972, p. 68-78.

Menhaden resource mentioned.

Hudson River Fisheries Investigation.

1965-1968. [n.d.] Evaluations of a proposed pumped storage project at Cornwall, New York in relation to fish in the Hudson River. Presented to Consolidated Edison Company of New York, Inc., by the Hudson River Policy Committee, 50 p., appendix 30 p.

Menhaden listed among species caught.

Huntsman, Gene R., and Robert B. Chapoton.

1973. Biostatistical data acquisition in the menhaden fisheries. Transactions of the American Fisheries Society, vol. 102, no. 2, p. 452-456.

Methods used for statistical treatment of menhaden biological information.

Idyll, C. P., D. C. Tabb, and B. Yokel.

1968. The value of estuaries to shrimp, p. 83-90. In John D. Newsom [ed.], Proceedings of the Marsh and Estuary Management Symposium. Thomas J. Moran's Sons, Inc., Baton Rouge.

B. tyrannus and B. patronus mentioned.

Jensen, Albert C.

1967. A brief history of the New England offshore fisheries. U. S. Fish and Wildlife Service, Fishery Leaflet 594, 14 p.

B. tyrannus fishery mentioned.

Jensen, Albert C.

1970. Thermal loading in the marine district. New York Fish and Game Journal, vol. 17, no. 2, p. 65-80.

Long Island Sound supports B. tyrannus fishery.

Jensen, Albert C.

1971. Soviet fisheries and fisheries research off the east coast of the United States. Proceedings of the Gulf and Caribbean Fisheries Institute, 23rd Annual Session, 1970, p. 7-23.

Fisheries agreement protects B. tyrannus, p. 16.

Johnson, Donald W.

1968. Pesticides and fishes-A review of selected literature. Transactions of the American Fisheries Society, vol. 97, no. 4, p. 398-424.

B. tyrannus in a list of fishes included in pesticide literature.

Johnson, Kenneth Walter.

1973. Occurrence and abundance of fishes in the intake and discharge areas of the Cedar Bayou power station before and during the first year of plant operation. Ph.D. dissertation, Texas A&M University, College Station, 348 pp.

Number of young B. patronus collected by seines and trawls from October 1969 through December 1971.

Johnson, Roy B.

1966. The effects of engineering projects on the ecology of Jones Bay, p. 148-157. In Texas Parks and Wildlife Department, Coastal Fisheries Project Report, 1966.

B. patronus was the most abundant fish, being present in all salinities throughout the estuary from the middle of April through the last of August.

Jones, Robert S.

1965. Fish stocks from a helicopter-borne purse net sampling of Corpus Christi Bay, Texas, 1962-1963. Publications of the University of Texas, Institute of Marine Science, vol. 10, p. 68-75.

B. patronus constituted 36 percent by weight of all the fishes caught, while B. gunteri represented 5 percent of total wet weight of fishes.

Jones, Robert S., William B. Ogletree, John H. Thompson, Jr., and William Flenniken.

1963. Helicopter borne purse net for population sampling of shallow marine bays. Publications of the University of Texas, Institute of Marine Science, vol. 9, p. 1-6.

B. patronus was taken in deep water sampling trials.

Jordan, David Starr.

1887. A preliminary list of the fishes of the West Indies. Proceedings of the U.S. National Museum, vol. 9, p. 554-608.

B. tyrannus aurea no locality, tropical America, south of the Florida Keys and not including Brazil.

Jordan, David Starr.

1914. American food and game fishes. New Nature Library, vol. 6, no. 1, 572 p. Doubleday, Page and Co., New York.

Reprinting of 1903 edition. Brief general account of B. tyrannus, p. 108-111.

Jorgenson, Sherrell C., and Grant L. Miller.

1968. Length relations of some marine fishes from coastal Georgia. U.S. Fish and Wildlife Service, Special Scientific Report - Fisheries no. 575, 16 p.

Conversion of standard, fork, and total lengths for 82 species of marine fish including B. tyrannus and B. smithi.

Joseph, Edwin B.

1962. Industrial or scrap-fish catch from pound nets in lower Chesapeake Bay - 1960. Virginia Institute of Marine Science, Gloucester Point, Special Scientific Report no. 35, 47 p.

B. tyrannus principal species in pound net catches by locality and date.

June, Fred C.

1963. The menhaden fishery, p. 146-159. In Maurice E. Stansby [ed.], Industrial fishery technology. Reinhold Publishing Corp., New York.

Review of menhaden resource, fishery and processing industry.

June, Fred C.

1965. Comparison of vertebral counts of Atlantic menhaden. U.S. Fish and Wildlife Service, Special Scientific Report - Fisheries no. 513, 12 p.

Vertebral counts from 6,048 B. tyrannus from three locations along the Atlantic coast showed statistical differences between spring and autumn spawning groups.

June, Fred C.

1972. Variations in size and length composition of Atlantic menhaden groupings. National Marine Fisheries Service, Fishery Bulletin, vol. 70. no. 3, p. 699-713.

Length and weight composition of summer and autumn schools of Atlantic menhaden from single purse-seine sets. Menhaden school by size and the average length of summer schools decreased with decreasing abundance of fish in a given area.

June, Fred C., and Frank T. Carlson.

1971. Food of young Atlantic menhaden, Brevoortia tyrannus, in relation to metamorphosis. National Marine Fisheries Service, Fishery Bulletin, vol. 68, no. 3, p. 493-512.

Larvae eat zooplankton but prejuveniles and juveniles eat phytoplankton. Similarities and differences between alimentary tract contents and plankton community. Significant changes in alimentary tract morphology with metamorphosis. Results of experimental feeding.

June, Fred C., and Frank T. Carlson.

1973. Food and feeding habits of Atlantic menhaden in relation to metamorphosis of larvae into juveniles, p. 136-137. (Abstract). In A. L. Pacheco [ed.], Proceedings of a Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast estuaries. National Marine Fisheries Service, Middle Atlantic Coastal Fisheries Center, Technical Publication no. 1.

Larval B. tyrannus feed by capturing zooplankton, chiefly copepods. After metamorphosis food consists mainly of phytoplankton.

June, Fred, C., and William R. Nicholson.

1964. Age and size composition of the menhaden catch along the Atlantic coast of the United States, 1958 with a brief review of the commercial fishery. U.S. Fish and Wildlife Service, Special Scientific Report - Fisheries no. 446, 40 p.

A review of the fishery for B. tyrannus during 1958 with distribution of purse seine sets and length and weight by sex for four geographical areas and the North Carolina fall fishery.

June, F. C., and Staff.

1964. Annual report of the Bureau of Commercial Fisheries Biological Laboratory, Beaufort, N.C., for the fiscal year ending June 30, 1963. U.S. Fish and Wildlife Service, Circular 198, 26 p.

An annual review of menhaden research including sampling the catch, morphology and population studies, estimation of juvenile abundance, and methods of marking and recovery.

Kantner, Arthur H.

1971. Comments on economic and financial aspects of the Gulf fisheries. Proceedings of the Gulf and Caribbean Fisheries Institute, 23rd Annual Session, 1970, p. 37-42.

Menhaden industry and future trends discussed.

Karpukhov, S. Ya.

1962. Menhaden. Rybnoe Khoziaistvo. vol. 38, no. 8, p. 16-19.

Brief, popular account with no new information and no literature cited.

Kelley, John Richard, Jr.

1965. A taxonomic survey of the fishes of Delta National Wildlife Refuge with emphasis upon distribution and abundance. M.S. thesis, Louisiana State University, 133 p.

Juvenile Gulf menhaden occurred in peak abundance from October to January.

Kelly, John A., Jr., and Alexander Dragovich.

1968. Occurrence of macrozooplankton in Tampa Bay, Florida, and the adjacent Gulf of Mexico. U. S. Fish and Wildlife Service, Fishery Bulletin, vol. 66, no. 2, p. 209-221.

Seventy-seven percent of the clupeoids (3-20 mm long) were identified as Brevoortia.

Keup, Lowell, and Jack Bayless.

1964. Fish distribution at varying salinities in Neuse River basin, North Carolina. Chesapeake Science, vol. 5, no. 3, p. 119-123.

B. tyrannus collected at 50 percent of the stations in a salinity range of 0.39-12.22 ppt.

Kingston, N., W. A. Dillon, and W. J. Hargis, Jr.

1969. Studies on larval Monogenea of fishes from the Chesapeake Bay area. Part I. Journal of Parasitology, vol. 55, no. 3, p. 544-558.

Parasites on B. tyrannus.

Kinnear, Brian S.

1973. Atlantic menhaden, p. 268-269, 280-283, 296-297. In A. L. Pacheco [ed.], Proceedings of a Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries. National Marine Fisheries Service, Middle Atlantic Coastal Fisheries Center, Technical Publication no. 1.

Distribution and early development of juvenile B. tyrannus in Atlantic Coast estuaries with a list of sites sampled.

Kinnear, Brian S., and Charles M. Fuss, Jr.

1971. Thread herring distribution off Florida's west coast. Commercial Fisheries Review, vol. 33, nos. 7-8, p. 27-39.

Gulf menhaden purse-seine fishery included catches of Atlantic thread herring, Opisthonema oglinum.

Klima, E. F.

1971. The automated fishing platform, p. 498-501. In H. Kristjonsson [ed.], Modern fishing gear of the world: 3. Fishing News (Books) Ltd., London.

B. patronus resource mentioned but the species not included in the catches from the platform.

Klima, Edward F., and Durbin C. Tabb.

1959. A contribution to the biology of the spotted weakfish, Cynoscion nebulosus (Cuvier), from northwest Florida, with a description of the fishery. Florida Board of Conservation, Technical Series no. 30, 25 p.

Menhaden collected by beach seine in Apalachicola Bay.

Kreutzer, Conradin O.

1963. Electrofishing with bottom trawls at sea. Proceedings of the Gulf and Caribbean Fisheries Institute, 15th Annual Session, 1962, p. 26-29.

Electrofishing applied to menhaden industry.

Kreutzer, Conradin O.

1964. Utilization of fish reactions to electricity in sea fishing, p. 545-551. In Modern fishing gear of the world: 2. Fishing News (Books), Ltd., London.

Describes an electrical technique improving the efficiency of menhaden purse seining.

Kroger, Richard L., and Robert L. Dryfoos.

1972. Tagging and tag-recovery experiments with Atlantic menhaden, Brevoortia tyrannus. National Marine Fisheries Service, Special Scientific Report, Fisheries no. 664, 11 p.

Juvenile and adult B. tyrannus were tagged experimentally in 1965 and 1969 and tag recovery tests were conducted at menhaden reduction plants at Beaufort, N.C.

Kroger, Richard L., and James F. Guthrie.

1971. Incidence of crooked vertebral columns in juvenile Atlantic menhaden, Brevoortia tyrannus. Chesapeake Science, vol. 12, no. 4, p. 276-278.

Twelve juvenile Atlantic menhaden with crooked vertebral columns were found in collections from Massachusetts. About 20,000 juveniles from 19 other estuaries along the coast from Massachusetts to Florida were examined and none others with deformed vetebral columns were found.

Kroger, Richard L., and James F. Guthrie.

1972a. Effect of predators on juvenile menhaden in clear and turbid estuaries. National Marine Fisheries Service, Marine Fisheries Review, vol. 34, nos. 11-12, p. 78-80.

Observations of injuries and scars on young Gulf and Atlantic menhaden indicate that predation is greater in clear water streams than in turbid ones.

Kroger, Richard L., and James F. Guthrie.

1972b. Incidence of the parasitic isopod, Olencira praegustator, in juvenile Atlantic menhaden. Copeia, 1972, no. 2, p. 370-374.

Frequency of occurrence of parasite in mouth and gill chamber of Atlantic menhaden in 19 estuaries from Massachusetts to Florida with notations on the amount of gill damage.

Kroger, Richard L., and James F. Guthrie.

1972c. Occurrence of the branchiuran, Argulus alosae, on dying Atlantic menhaden, Brevoortia tyrannus, in the Connecticut River. Transactions of the American Fisheries Society, vol. 101, no. 3, p. 559-560.

Heavy infestation of fish lice on adult Atlantic menhaden was coincident with mortality in September 1970.

Kroger, Richard L., and James F. Guthrie.

1973a. Additional anomalous menhaden and other fishes. Chesapeake Science, vol. 14, no. 2, p. 112-116.

Reports on deformed B. patronus and B. tyrannus obtained during juvenile menhaden abundance surveys along the Gulf and Atlantic coasts of the U.S.

Kroger, Richard L., and James F. Guthrie.

1973b. Migrations of tagged juvenile Atlantic menhaden. Transactions of the American Fisheries Society, vol. 102, no. 2, p. 417-422.

Recoveries of tags from juvenile B. tyrannus tagged from 1967 to 1971 showed coastal migrations during the following years.

Kroger, Richard L., Robert L. Dryfoos, and Gene R. Huntsman.

1971. Movement of juvenile Atlantic menhaden tagged in New England waters. Chesapeake Science, vol. 12, no. 2, p. 114-115.

Four tags from 1,020 juvenile Atlantic menhaden tagged in Rhode Island in October 1969 were recovered. One in January and two in June at Beaufort, N.C., and one Fernandina Beach, Fla., July 1970.

Kudo, Richard R.

1966. Protozoology. 5th ed. Charles C. Thomas, Springfield, Ill. 1,174 p.

Describes and illustrates Eimeria brevoortiana and Kudoa clupeidae from the host, B. tyrannus.

Kutkuhn, Joseph H.

1966. Bureau of Commercial Fisheries interests in estuarine ecology, p. 45-51. In Proceedings, Symposium on Estuarine Ecology, Coastal Waters of North Carolina. Water Resources Research Institute, Raleigh.

Review of menhaden research program.

Lanham, Url.

1962. The fishes. Columbia University Press, New York, 116 p.

Menhaden mentioned as plankton feeder and as fish used by American Indians as fertilizer.

Lear, W. H., and J. H. C. Pippy.

1971. A record of the Atlantic menhaden (Brevoortia tyrannus) from Northumberland Strait. Journal of the Fisheries Research Board of Canada, vol. 28, no. 3, p. 461-462.

Northern extension of the range of B. tyrannus of 104 miles and an eastern extension of 63 miles or approximately 740 sea miles from the Bay of Fundy, the previous record.

Leim, A. H., and W. B. Scott.

1966. Fishes of the Atlantic coast of Canada. Fisheries Research Board of Canada, Bulletin no. 155, 485 p.

Atlantic menhaden, p. 93-94.

Levi, Eldon J.

1973. Juvenile yellowfin menhaden from the Bahama Islands. Transactions of the American Fisheries Society, vol. 102, no. 4, p. 848-849.

First record of a North American menhaden, B. smithi, from beyond the Continental Shelf.

Lewis, D. H., L. C. Grumbles, S. McConnell, and A. I. Flowers.

1970. Pasteurella-like bacteria from an epizootic in menhaden and mullet in Galveston Bay. Journal of Wildlife Diseases, vol. 6, no. 3, p. 160-162.

Culture analysis and tests from fish kill.

Lewis, Robert M.

1965. The effect of minimum temperature on the survival of larval Atlantic menhaden, Brevoortia tyrannus. Transactions of the American Fisheries Society, vol. 94, no. 4, p. 409-412.

Results of laboratory experiments on the lethal effects of -1 to 8°C on menhaden larvae acclimated at 7, 10, 12.5, 15 and 20°C.

Lewis, Robert M.

1966. Effects of salinity and temperature on survival and development of larval Atlantic menhaden, Brevoortia tyrannus. Transactions of the American Fisheries Society, vol. 95, no. 4, p. 423-426.

Results of laboratory experiments on the lethal effects of 2-6°C in salinities of 0-30 ppt on menhaden larvae acclimated at 10 and 15°C.

Lewis, Robert M., and William F. Hettler, Jr.

1968. Effect of temperature and salinity on the survival of young Atlantic menhaden, Brevoortia tyrannus. Transactions of the American Fisheries Society, vol. 97, no. 4, p. 344-349.

Results of laboratory experiments of the lethal effects of high and low temperatures at different salinities on juvenile menhaden acclimated at different temperatures.

Lewis, Robert M., William F. Hettler, Jr., E. Peter H. Wilkens, and G. Nelson Johnson.

1970. A channel net for catching larval fishes. Chesapeake Science, vol. 11, no. 3, p. 196-197.

Description of a channel net designed to catch larval Atlantic menhaden in tidal currents.

Lewis, Robert M., and Walter C. Mann.

1971. Occurrence and abundance of larval Atlantic menhaden, Brevoortia tyrannus, at two North Carolina inlets with notes on associated species. Transactions of the American Fisheries Society, vol. 100, no. 2, p. 296-301.

Relative abundance indexes of Atlantic menhaden larvae entering estuaries from November to April, 1966-67 and 1967-68. Larvae most abundant during March and in night collections. Catches included the young of 23 other fishes.

Lewis, Robert M., and Walter C. Mann.

1973. Occurrence and abundance of larval Atlantic menhaden, Brevoortia tyrannus, at two North Carolina inlets and a list of associated species, p. 142-147. In A. L. Pacheco [ed.], Proceedings of a Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries. National Marine Fisheries Service, Middle Atlantic Coastal Fisheries Center, Technical Publication no. 1.

Comparison of the relative abundance of B. tyrannus larvae at Beaufort and Bogue Inlets, 1966-68.

Lewis, Robert M., and E. Peter H. Wilkens.

1971. Abundance of Atlantic menhaden larvae and associated species during a diel collection at Beaufort, N.C. Chesapeake Science, vol. 12, no. 3, p. 185-187.

Abundance of Atlantic menhaden, spot and pinfish larvae in continuous collections from a tidal channel during a 24-hour period was examined by analysis of variance to show the effects of species, depth, light and tide.

Lewis, Robert M., E. Peter H. Wilkens, and Herbert R. Gordy.

1972. A description of young Atlantic menhaden, Brevoortia tyrannus in the White Oak estuary, North Carolina. National Marine Fisheries Service, Fishery Bulletin, vol. 70, no. 1, p. 115-118.

Length-weight relations for larval, prejuvenile, and juvenile Atlantic menhaden collected along a salinity gradient in a tidal stream.

Lippson, Alice Jane.

1973. The Chesapeake Bay in Maryland: An atlas of natural resources. Natural Resources Institute, University of Maryland, Johns Hopkins University Press, Baltimore, 55 p.

Map of juvenile and adult Atlantic menhaden distribution in Maryland section of Chesapeake Bay.

Livingstone, Robert, Jr.

1965. A preliminary bibliography with KWIC index on the ecology of estuaries and coastal areas of the Eastern United States. U.S. Fish and Wildlife Service, Special Scientific Report - Fisheries no. 507, 352 p.

Fifty-five references to menhaden, genus Brevoortia, included in Reintjes, Christmas, and Collins (1960), Reintjes (1964), and this bibliography.

Longhurst, Alan R.

1971. The clupeoid resources of tropical seas, p. 349-385. In Harold Barnes [ed.], Oceanography and marine biology, an annual review, vol. 9. Hafner Publishing Co., New York.

Menhaden fishery mentioned.

Lorio, Wendell J., and Harry E. Schafer.

1966. A food habit study of the spotted seatrout, Cynoscion nebulosus, in the Biloxi Marsh area, Louisiana. Proceedings of the 19th Annual Conference, Southeastern Association of Game and Fish Commissioners, 1965, p. 289-296.

Menhaden found in stomachs of spotted seatrout.

Love, R. Malcolm.

1970. The chemical biology of fishes. Academic Press, New York, 547 p.

Reference to physiology of B. patronus.

Love, R. M., J. A. Lovern, and N. R. Jones.

1959. The chemical composition of fish tissues. Great Britain Department of Scientific and Industrial Research, Food Investigation, Special Report no. 69, 62 p.

Composition of brain and spinal cord of B. tyrannus listed on p. 10 and 11.

Lowe, Jack I.

1966. Some effects of endrin on estuarine fishes. Proceedings of the 19th Annual Conference, Southeastern Association of Game and Fish Commissioners, 1965, p. 271-276.

Toxicity of endrin on B. tyrannus.

Lukton, A., and H. S. Olcott.

1958. Content of free imidazole compounds in the muscle tissue of aquatic animals. Food Research, vol. 23, no. 6, p. 611-618.

Anserine and carnosine in muscles of B. tyrannus.

Lux, F. E., and F. E. Nichy.

1971. Number and lengths, by season, of fishes caught with an otter trawl near Woods Hole, Massachusetts, September 1961 to December 1962. National Marine Fisheries Service, Special Scientific Report - Fisheries no. 622, 15 p.

One B. tyrannus 33 mm fork length in August 1962.

McColl, J. D., and R. J. Rossiter.

1952a. A comparative study of the lipids of the vertebrate central nervous system. I. Brain. Journal of Experimental Biology, vol. 29, p. 196-202.

Lipids in B. tyrannus brain.

McColl, J. D., and R. J. Rossiter.

1952b. A comparative study of the lipids of the vertebrate central nervous system. II. Spinal cord. Journal of Experimental Biology vol. 29, p. 203-210.

Lipids in B. tyrannus spinal cord.

McFarland, William N.

1963. Seasonal change in the number and the biomass of fishes from the surf at Mustang Island, Texas. Publications of the University of Texas, Institute of Marine Science, vol. 9, p. 91-105.

A few B. patronus were captured on several occasions during the summer.

McHugh, J. L.

1966. Management of estuarine fisheries, p. 133-154. In A symposium on estuarine fisheries. American Fisheries Society, Special Publication no. 3.

Problems of menhaden fishery and economic importance.

McHugh, J. L.

1967. Estuarine nekton, p. 581-620. In George H. Lauff [ed.], Estuaries. American Association for the Advancement of Science, Publication no. 83, Washington, D.C.

Menhaden mentioned with estimate of growth of B. tyrannus in Chesapeake Bay.

McHugh, J. L.

1969a. Comparison of Pacific sardine and Atlantic menhaden fisheries. Fiskeridirektoratets Skrifter, Serie Havundersøkelser, vol. 15 no. 3, p. 356-367.

Comparison of life histories, fisheries and dynamics of sardine and menhaden resources with a brief review of the present condition and future prospects for the Atlantic menhaden.

McHugh, J. L.

1969b. Fisheries of Chesapeake Bay. Proceedings of the Governor's Conference on Chesapeake Bay, September 12-13, 1968, p. II-135-II-160.

Historical review of fisheries including Atlantic menhaden, B. tyrannus. Graph of total Atlantic coast landings of menhaden, 1875-1966.

McHugh, J. L.

1972a. Jeffersonian democracy and the fisheries, p. 134-155. In B. J. Rothschild [ed.], World fisheries policy-Multidisciplinary views. University of Washington Press, Seattle.

Menhaden fishery discussed.

McHugh, J. L.

1972b. Marine fisheries of New York State. National Marine Fisheries Service, Fishery Bulletin, vol. 70, no. 3, p. 585-610.

Atlantic menhaden resource discussed with New York landings, 1880-1970.

McKenney, Thomas W.

1972. Fish eggs and larvae from Port Royal Sound and adjacent waters, p. 233-240. In Port Royal Sound environmental study. South Carolina Water Resources Commission.

B. tyrannus mentioned. No menhaden eggs or larvae.

McKernan, Donald L.

1964. Fisheries and oceanography, p. 202-218. In E. John Long [ed], Ocean sciences. U.S. Naval Institute, Annapolis, Md.

Use of electricity in menhaden fishery and brief mention of menhaden and estuaries.

McKernan, Donald L.

1972. World fisheries-world concern, p. 35-51. In B. J. Rothschild [ed.], World fisheries policy-Multidisciplinary views. University of Washington Press, Seattle.

Menhaden resource mentioned.

McLane, William McNair.

1955. The fishes of the St. Johns River system. Ph.D. thesis, University of Florida, 361 p.

Account of B. smithi; range, habitat, abundance, feeding habits, and parasites.

McLusky, Donald S.

1971. Ecology of estuaries. Heinemann Educational Books, London, 144 p.

Menhaden mentioned on p. 102.

McMahon, John W.

1963. Monogenetic trematodes from some Chesapeake Bay fishes. Part I: The superfamilies Capsaloidea Price, 1936 and Diclidophoroidea Price, 1936. Chesapeake Science, vol. 4, no. 4, p. 151-160.

Descriptions of the trematode parasites, Clupeocotyle brevoortia and Mazocraeoides georgei which parasitize B. tyrannus, B. patronus, and B. gunteri.

Manooch, Charles S., III.

1973. Food habits of yearling and adult striped bass, Morone saxatilis (Walbaum), from Albemarle Sound, North Carolina. Chesapeake Science, vol. 14, no. 2, p. 73-86.

Brevoortia tyrannus composed the principal food of 1,094 striped bass, 125 to 714 mm total length in Albemarle Sound from July 1970 to August 1971. The accounted for 54% by number and 50% by volume.

Manski, W., S. P. Halbert, and T. P. Auerbach.

1964. Immunochemical analysis of the phylogeny of lens proteins, p. 545-562. In Charles A. Leone [ed.], Taxonomic biochemistry and serology. The Ronald Press Company, New York.

Menhaden lens proteins were utilized in a seriological study of vertebrate phylogeny.

Mansueti, Alice J., and Jerry D. Hardy, Jr.

1967. Development of fishes of the Chesapeake Bay Region: An atlas of egg, larval, and juvenile stages. Part I. Natural Resources Institute, University of Maryland, 202 p.

B. tyrannus described on p. 64-69.

Mansueti, Romeo J.

1960a. Comments on the roughtail stingray, Dasyatis centroura, in Maryland waters. Chesapeake Science, vol. 1, no. 1, p. 76-77.

Remains of a B. tyrannus found in stomach of stingray collected at the mouth of the Chesapeake Bay.

Mansueti, Romeo J.

1960b. The occurrence of the rough scad, Trachurus lathami, in Chesapeake Bay, Maryland. Chesapeake Science, vol. 1, no. 2, p. 117-118.

Mentioned occurrence of menhaden in balloon trawl catches in Bay.

Mansueti, Romeo J.

1962a. Effects of civilization on striped bass and other estuarine biota in Chesapeake Bay and tributaries. Proceedings of the Gulf and Caribbean Fisheries Institute, 14th Annual Session, 1961, p. 110-136.

Atlantic menhaden, B. tyrannus, mentioned.

Mansueti, Romeo J.

1962b. Eggs, larvae, and young of the hickory shad, Alosa mediocris, with comments on its ecology in the estuary. Chesapeake Science, vol. 3, no. 3, p. 173-205.

Figure comparing head outlines with larval Atlantic menhaden, B. tyrannus.

Mansueti, Romeo J.

1964. Eggs, larvae, and young of the white perch, Roccus americanus, with comments on its ecology in the estuary. Chesapeake Science, vol. 5, no. 1-2, p. 3-45.

Larvae of B. tyrannus mentioned.

Marcellus, Kenneth Lee.

1972. Fishes of Barnegat Bay, New Jersey, with particular reference to seasonal influences and the possible effects of thermal discharges. Ph.D. thesis, Rutgers University, 190 p. (Dissertation Abstracts, vol. 33, no. 5, p. 2185-B - 2186-B.)

B. tyrannus included in haul-seine catches. Only 75 caught during a 4-year study.

Margalef, R.

1969. Pelagic ecosystem in the area, p. 127. In Symposium on investigations and resources of the Caribbean Sea and adjacent regions. Abstract FAO Fisheries Report no. 71.1.

Brevoortia important among clupeoid fishes in the region.

Marine Pollution Bulletin.

1970. Fish kills in Florida. Marine Pollution Bulletin, vol. 1, no. 10, p. 148.

Ten to fifteen million menhaden (Brevoortia sp.) were killed in Escambia Bay on September 3, 1970. This is one of 42 kills reported in the Bay since June 21. Presumed cause of kills was over-nutrification, a condition that has caused summer kills of menhaden for the past 10 years.

Marine Pollution Bulletin.

1973. Menhaden killed near Pilgrim Power Station. Marine Pollution Bulletin, vol. 4, no. 6, p. 86.

Estimated kill of 10,000 adult Atlantic menhaden from gas embolism from supersaturation of water with nitrogen from plant effluent canal.

Marine Research Incorporated.

1973. Rome Point investigations. Quarterly Progress Report, June - August 1973, Marine Research Inc., East Wareham, Mass. 150 p. (unpaged).

Occurrence and numbers of eggs and larvae of Brevoortia tyrannus and other fishes in Narragansett Bay.

Marsh, M. C., and F. P. Gorham.

1905. The gas disease in fishes. Report of the U.S. Bureau of Fisheries for 1904, p. 343-395.

Menhaden mortalities in Narragansett Bay during the summer of 1904 with exophthalmia or "pop-eye".

Marshall, N. B.

1971. Explorations in the life of fishes. Harvard University Press, Cambridge, 204 p.

Brief comment on the coloration of juvenile Brevoortia.

Massmann, William H.

1962. Water temperature, salinities, and fishes collected during trawl surveys of Chesapeake Bay and York and Pamunkey Rivers, 1956-1959. Virginia Institute of Marine Science, Gloucester Point, Special Scientific Report no. 27, 57 p.

B. tyrannus included.

Massmann, William H.

1963. Annulus formation on the scales of weakfish, Cynoscion regalis, of Chesapeake Bay. Chesapeake Science, vol. 4, no. 1, p. 54-56.

Brief mention of scale growth of B. tyrannus.

Massmann, William H.

1967. A positive approach to coastal sport fishery problems. Proceedings of the 18th Annual Conference, Southeastern Association of Game and Fish Commissioners, 1964, p. 255-258.

Importance of estuaries to the young of menhaden.

Massmann, William H.

1971. The significance of an estuary on the biology of aquatic organisms of the middle Atlantic region, p. 96-109. In Philip A. Douglas and Richard H. Stroud [eds.], A symposium on biological significance of estuaries. Sport Fishing Institute, Washington, D. C.

Atlantic menhaden mentioned.

Massmann, William H., and Romeo J. Mansueti.

1963. Data from Virginia-Maryland cooperative fish trawl surveys in Chesapeake Bay - 1957 and 1958. Virginia Institute of Marine Science, Gloucester Point, Special Scientific Report no. 42, 21 p.

Catch of B. tyrannus with temperature and salinities.

Massmann, William H., John J. Norcross, and Edwin B. Joseph.

1963. Distribution of larvae of the naked goby, Gobiosoma bosci, in the York River. Chesapeake Science, vol. 4, no. 3, p. 120-125.

Menhaden occurrence briefly mentioned.

Matthiessen, George C.

1972-1973. Rome Point investigations. Quarterly Progress Reports, June-August, September-November and December 1973-February 1973, Marine Research Inc., East Wareham, Mass. (unpaged).

Mazyck, W. St. J.

1887. Dead fish along the coast of South Carolina. Bulletin of the U.S. Fish Commission for 1886, vol. 6, p. 413-414.

Mass mortality of young menhaden in late December of unknown causes.

Mead, A. D.

1898. Peridinium and the "red water" in Narragansett Bay. Science, vol. 8, no. 203, p. 707-709.

Atlantic menhaden, B. tyrannus, among the principal fish killed.

Meldrim, John W.

1971. An experimental study of the behavior of estuarine fishes to a proposed thermal effluent. Proceeding of the Fourth Mid-Atlantic Industrial Waste Conference, November, 1970, University of Delaware, p. 65-74.

B. tyrannus among estuarine fishes tested in the laboratory for avoidance responses to increased temperature gradients.

Meldrim, John W., and James J. Gift.

1971. Temperature preference, avoidance and shock experiments with estuarine fishes. Ichthyological Associates, Ithaca, New York, Bulletin 7, 72 p.

B. tyrannus prefer temperature at 70°F and avoid temperatures from 78-80°F.

Merchant, George, Jr.

1884. The incipiency of night-seining for mackerel. Bulletin of the U.S. Fish Commission, vol. 4, p. 142.

Seining menhaden at night.

Merriner, J. V., and W. L. Wilson.

1972. Jaw deformity (cross bite) of Atlantic menhaden, B. tyrannus, from Virginia. Chesapeake Science, vol. 13, no. 1, p. 62-63.

One B. tyrannus with deformed jaw was caught in James River with river herring, American shad and Bay anchovy.

Miller, Grant L., and Sherrell C. Jorgenson.

1969. Seasonal abundance and length frequency distribution of some marine fishes in coastal Georgia. U.S. Fish and Wildlife Service, Data Report 35, 102 p.

Length frequency of B. tyrannus and B. smithi by month with weather, tide, water temperature and salinity. Only other clupeoids were Anchoa hepsetus and A. mitchilli.

Miller, Grant L., and Sherrell C. Jorgenson.

1973. Meristic characters of some marine fishes of the Western Atlantic Ocean. National Marine Fisheries Service, Fishery Bulletin, vol. 71, no. 1, p. 301-312.

Brevoortia gunteri, patronus, tyrannus and smithi listed with counts of precaudal and caudal vertebrae, dorsal, anal and caudal fin rays.

Miller, John M.

1965. A trawl survey of the shallow Gulf fishes near Port Aransas, Texas. Publications of the University of Texas, Institute of Marine Science, vol. 10, p. 80-107.

Three small B. patronus (55, 68, and 190 mm) were captured at 3 and 6 fathoms on February 19, April 1, and June 2, 1964.

Miller, Robert Victor.

1969. Constancy of epibranchial organs and fourth epibranchial bones within species groups of clupeid fishes. Copeia, 1969, no. 2, p. 308-312.

Comparison of epibranchial organs and fourth epibranchial bones of 5 species of Brevoortia with species of Opisthonema, Dorosoma and Clupea.

Monod, Theodore.

1968. Le complexe urophore des poissons teleosteens. Memoires de l'Institut Fondamental d'Afrique Noire, no. 81, 705 p.

Ethmalosa fimbriata and B. tyrannus listed with figures of E. fimbriata.

Moseley, Frank N., and B. J. Copeland.

1969. A portable drop-net for representative sampling of nekton. Contributions in Marine Science of the University of Texas, Institute of Marine Science, vol. 14, p. 37-45.

B. patronus, the principal species caught.

Moss, S. A., and W. N. McFarland.

1970. The influence of dissolved oxygen and carbon dioxide on fish schooling behavior. Marine Biology, vol. 5, no. 2, p. 100-107.

Dense schooling of B. tyrannus mentioned.

Moulton, James M.

1956. The movements of menhaden and butterfish in a sound field. Anatomical Record, vol. 125, no. 3, p. 592.

Abstract of 15 minute motion picture.

Moulton, James M.

1963. Acoustic orientation of marine fishes and invertebrates. Ergebnisse der Biologie, Band 26, p. 27-39.

Reaction of menhaden to underwater sound.

Moulton, James M., and Richard H. Dixon.

1967. Directional hearing in fishes, p. 187-232. In W. N. Tavolga [ed.], Marine bio-acoustics, vol. 2, Pergamon Press, New York.

Brevoortia ear structure and function.

Moulton, James M., and Jules M. Lerner.

1963. The ear-air bladder connections of the menhaden, B. tyrannus. (Abstract). American Zoologist, vol. 3, no. 4, p. 498.

Roles of hearing, gas pressure regulation and depth perception.

Mulkana, Mohammed Saeed.

1966. The growth and feeding habits of juvenile fishes in two Rhode Island estuaries. Gulf Research Reports, vol. 2, no. 2, p. 97-167.

Occurrence of B. tyrannus and estimated growth from successive collections from July to October. Stomach contents of 300 young menhaden (10-80 mm) contained amorphous organic ooze and dinoflagellates with few diatoms or crustaceans.

Muncy, Robert J.

1960. A study of the comparative efficiency between nylon and linen gillnets. Chesapeake Science, vol. 1, no. 2, p. 96-102.

B. tyrannus among the clupeids listed in gillnet catches from Chesapeake Bay.

Musick, John A., and James G. Hoff.

1968. Vertebral anomalies in humpbacked specimens of menhaden, Brevoortia tyrannus. Transactions of the American Fisheries Society, vol. 97, no. 3, p. 277-278.

Three humpbacked menhaden were collected along with 335 normal menhaden near Buzzards Bay, Mass.

Myers, George S.

1964. A brief sketch of the history of ichthyology in America to the year 1850. Copeia, 1964, no. 1, p. 33-41.

A brief mention of the origin of the generic name Brevoortia.

Nahhas, F. M., and R. B. Short.

1965. Digenetic trematodes of marine fishes from Apalachee Bay, Gulf of Mexico. Tulane Studies in Zoology, vol. 12, no. 2, p. 39-50.

Digenetic trematodes in Brevoortia.

Nelson, Gareth J.

1967a. Epibranchial organs in lower teleostean fishes. Journal of Zoology, vol. 153, no. 1, p. 71-89.

Description of gill arches in Brevoortia and other clupeoid genera.

Nelson, Gareth J.

1967b. Gill arches of teleostean fishes of the family Clupeidae. Copeia, 1967, no. 2, p. 389-399.

The genera Brevoortia, Ethmalosa, and Ethmidium are discussed with reference to the morphology of gill arches.

Nicholson, William R.

1971a. Changes in catch and effort in the Atlantic menhaden purse-seine fishery, 1940-68. National Marine Fisheries Service, Fishery Bulletin, vol. 69, no. 4, p. 765-781.

Analysis of catch, number of vessel weeks, and catch per vessel week in the Atlantic menhaden fishery.

Nicholson, William R.

1971b. Coastal movements of Atlantic menhaden as inferred from changes in age and length distributions. Transactions of the American Fisheries Society, vol. 100, no. 4, p. 708-716.

Length frequency distributions plotted by age, month, and latitude support the hypothesis of an annual north-south movement.

Nicholson, William R.

1972a. Fishing pressure and its influence on Monday catches of Atlantic menhaden in the Chesapeake Bay purse-seine fishery. Chesapeake Science, vol. 13, no. 3, p. 215-218.

Until about 1955 Atlantic menhaden purse-seine catches in Chesapeake Bay were distributed equally among week days from Monday to Friday. From 1956-61 the catch landed on Mondays averaged about 22 percent of the weekly totals. As fishing pressure increased and the population decreased after 1961, the percentage of the catch landed on Mondays rose, averaging about 34 percent of the weekly total. The increase in Monday catches is attributed to greater availability of fish after reduced fishing over the weekend.

Nicholson, William R.

1972b. Population structure and movements of Atlantic menhaden, Brevoortia tyrannus, as inferred from back-calculated length frequencies. Chesapeake Science, vol. 13, no. 3, p. 161-174.

Conclusions from analysis of back-calculated fork lengths sampled from 1955-64: (1) mixing of menhaden of all ages from all areas occurs south of Cape Hatteras during the winter, (2) at the time of first annulus formation in early spring, age-1 menhaden segregate along the coast by size, which increases from south to north, (3) all menhaden do not return to the same area they occupied the previous year, (4) for normal year classes, recruitment into the fishable population may not be complete until late in the second summer of life.

Nicholson, William R., and Joseph R. Higham, Jr.

1964a. Age and size composition of the menhaden catch along the Atlantic coast of the United States, 1959 with a brief review of the commercial fishery. U.S. Fish and Wildlife Service, Special Scientific Report - Fisheries no. 478, 34 p.

A review of the fishery for 1959 with distribution of purse-seine sets, length and weight by sex for four geographical areas and the North Carolina fall fishery.

Nicholson, William R., and Joseph R. Higham, Jr.

1964b. Age and size composition of the 1960 menhaden catch along the U.S. Atlantic coast with a brief review of the commercial fishery. U.S. Fish and Wildlife Service, Special Scientific Report - Fisheries no. 479, 41 p.

A review of the fishery for B. tyrannus during 1960 with distribution of purse-seine sets and length and weight by sex for four geographical areas and the North Carolina fall fishery.

Nicholson, William R., and Joseph R. Higham, Jr.

1965. Age and size composition of the menhaden catch along the Atlantic coast of the United States, 1961, with a brief review of the commercial fishery. U.S. Fish and Wildlife Service, Special Scientific Report - Fisheries no. 495, 28 p.

A review of the fishery for B. tyrannus during 1961 with distribution of purse-seine sets and length and weight by sex for four geographical areas and the North Carolina fall fishery.

Nicholson, William R., and Joseph R. Higham, Jr.

1966. Age and size composition of the menhaden catch along the Atlantic coast of the United States, 1962, with a brief review of the commercial fishery. U.S. Fish and Wildlife Service, Special Scientific Report - Fisheries no. 527, 24 p.

A review of the fishery for B. tyrannus during 1962 with distribution of purse-seine sets and length and weight by sex for four geographical areas and the North Carolina fall fishery.

Norcross, J. J., and W. Harrison.

1967. Part I, Introduction, p. 3-9. In W. Harrison, J. J. Norcross, N. A. Pore, and E. M. Stanley, Circulation of shelf waters off the Chesapeake Bight, surface and bottom drift of Continental Shelf waters between Cape Henlopen, Delaware, and Cape Hatteras, North Carolina, June 1963-December 1964. U.S. Department of Commerce, ESSA Professional Paper no. 3.

Atlantic menhaden, B. tyrannus, are spawned at sea and larvae are transported into nursery areas by ocean currents.

Norden, Carroll R.

1966. The seasonal distribution of fishes in Vermilion Bay, Louisiana. Transactions of the Wisconsin Academy of Sciences, Arts and Letters, vol. 55, p. 119-137.

B. patronus was one of the three most abundant species in fish collections from Vermilion Bay. Larval menhaden first appeared in catches in November and continued into April. Mentioned occurrence of B. gunteri in nearby Gulf waters.

Odum, William E.

1968. Mullet grazing on a dinoflagellate bloom. Chesapeake Science, vol. 9, no. 3, p. 202-204.

The presence of B. tyrannus noted in Duplin River, near Sapelo Island, Ga.

Oishi, Keiichi, and Ayako Okumura.

1963. Likes and dislikes of fish meat. Part I. By some Americans. Bulletin of the Faculty of Fisheries, Hokkaido University, vol. 14, no. 3, p. 182-192.

Americans dislike menhaden as a food source compared to beef and other marine products.

Ovchinnikov, V. V.

1964. The fish fauna composition of the Gulf of Mexico and some questions concerning its origin (in Russian). Trudy Atlanticheskii nauchno-issledovatel'skii Institut Rybnogo Khoziaistva i Okeanografii, vol. 11, p. 12-20.

B. tyrannus listed.

Oviatt, Candace, and George W. Gray, Jr.

1968. Juvenile lookdowns, Selene vomer, in Wickford Cove, Narragansett Bay, Rhode Island. Transactions of the American Fisheries Society, vol. 97, no. 1, p. 64.

B. tyrannus was taken in beach seines in the Bay.

Oviatt, C. A., A. L. Gall, and S. W. Nixon.

1972. Environmental effects of Atlantic menhaden on surrounding waters. Chesapeake Science, vol. 13, no. 4, p. 321-323.

Schools of Atlantic menhaden, B. tyrannus, have measurable effects upon the estuarine waters of Narragansett Bay, R.I., by their feeding, respiration and excretion. The concentrations of phytoplankton and oxygen decreased and ammonia increased within the immediate vicinity of schools.

Pacheco, Anthony L.

1962. Age and growth of spot in lower Chesapeake Bay, with notes on distribution and abundance of juveniles in the York River system. Chesapeake Science, vol. 3, no. 1, p. 18-28.

B. tyrannus mentioned.

Pacheco, Anthony L., and George C. Grant.

1965. Studies of the early life history of Atlantic menhaden in estuarine nurseries. Part I--Seasonal occurrences of juvenile menhaden and other small fishes in a tributary creek of Indian River, Delaware, 1957-58. U.S. Fish and Wildlife Service, Special Scientific Report - Fisheries no. 504, 32 p.

Monthly occurrences and size range of juvenile B. tyrannus and other small fishes from 32 families are summarized from 800 seine collections. Salinity and temperature observations for each collection are included.

Pacheco, Anthony L., and George C. Grant.

1973. Immature fishes associated with larval Atlantic menhaden at Indian River Inlet, Delaware, 1958-61, p. 78-117. In A. L. Pacheco [ed.], Proceedings of a Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries. National Marine Fisheries Service, Middle Atlantic Coastal Fisheries Center, Technical Publication no. 1.

Atlantic menhaden, bay anchovy, American eel, Atlantic silverside, summer and winter flounder made up 70% by numbers of the 59 species of fish collected during October to May, 1958-61.

Parker, Jack C.

1965. An annotated checklist of the fishes of the Galveston Bay system, Texas. Publications of the University of Texas, Institute of Marine Science, vol. 10, p. 201-220.

B. gunteri was seldom found in the bay, while B. patronus was abundant throughout the year.

Parker, R. O., Jr.

1972. An electric detector system for recovering internally tagged menhaden, genus Brevoortia. National Marine Fisheries Service, Special Scientific Report - Fisheries 654, 7 p.

Menhaden with internal ferromagnetic tags are recovered by an electronic device that does not interfere with reduction plant operations. Date and locality of capture are obtained for tagged fish as they are unloaded from the fishing vessel.

Parker, R. O., Jr.

1973. Menhaden tagging and recovery: Part II. Recovery of internal ferromagnetic tags used to mark menhaden, genus Brevoortia. Marine Fisheries Review, vol. 35, nos. 5-6, p. 36-39. Atlantic Estuarine Fisheries Center Beaufort, N.C. 28516.

Plate and rotating grate magnets were installed in reduction plants to recover tags from menhaden. Recovery efficiency was determined at each plant with test lots of large and small tags.

Pearse, A. S.

1947. On the occurrence of ectoconsortes on marine animals at Beaufort, N.C. Journal of Parasitology, vol. 33, no. 6, p. 453-458.

External copepod parasites on B. tyrannus are mentioned.

Pearson, John C.

1929. Natural history and conservation of redfish and other commercial sciaenids on the Texas coast. Bulletin of the U.S. Bureau of Fisheries for 1928, vol. 44, p. 129-214.

Menhaden is included in food of red drum.

Perkins, Richard J., and Michael D. Dahlberg.

1971. Fat cycles and condition factors of Altamaha River shads. Ecology, vol. 52, no. 2, p. 359-362.

Menhaden is mentioned in comparison with maximum fat content for Atlantic and Gulf menhadens.

Perret, William Stanley.

1966. Occurrence, abundance, and size distribution of fishes and crustaceans collected with otter trawl in Vermilion Bay, Louisiana. M.S. thesis, University of Southwestern Louisiana, Lafayette, La., 64 p.

B. patronus occurred at all stations.

Perret, William S.

1968. Menhaden or pogies: Louisiana's most valuable commercial fish. Louisiana Conservationist, vol. 20, nos. 1 & 2, p. 14-15.

Popular account of the purse-seine fishery for Gulf menhaden.

Peters, David S.

1972. Feeding selectivity in juvenile Atlantic menhaden, Brevoortia tyrannus, (Pisces: Clupeidae). (Abstract). ASB (Association of Southeastern Biologists) Bulletin, vol. 19, no. 2, p. 91.

Laboratory experiments to determine if menhaden feed selectively show that suspended and bottom particles of larger sizes were preferred to fine inorganic silt. Menhaden caught in the natural habitat ate mixed plankton while avoiding suspended silt.

Peterson, Ross.

1967. Design and economics of a new 86-foot aluminum multi-purpose fishing vessel. Proceedings of the Gulf and Caribbean Fisheries Institute, 19th Annual Session, 1966, p. 39-48.

A menhaden vessel is described.

Poole, John C.

1964. Feeding habits of the summer flounder in Great South Bay. New York Fish and Game Journal, vol. 11, no. 1, p. 28-34.

B. tyrannus is listed as a food item of the summer flounder.

Pratt, Joseph Hyde.

1917. The fisheries of North Carolina. Journal of the Elisha Mitchell Scientific Society, vol. 32, no. 4, p. 149-175.

B. tyrannus included among the important fisheries of the state.

President's Science Advisory Committee. Panel on Oceanography.

1966. Effective use of the sea. U.S. Government Printing Office, Washington, D. C.

Menhaden fishery is mentioned.

Pristas, Paul J.

1970. BCF scientists tag and recover menhaden. Commercial Fisheries Review, vol. 32, nos. 8-9, p. 47-49.

A brief review of menhaden tagging during 1966-69. Reported that 1,066,357 Atlantic menhaden, B. tyrannus, were tagged, with 203,037 recovered; and 35,198 Gulf menhaden, B. patronus were tagged with 6,860 recovered.

Pristas, Paul J., and Thurman D. Willis.

1973. Menhaden tagging and recovery: Part I. Field methods for tagging menhaden, genus Brevoortia. Marine Fisheries Review, vol. 35, nos. 5-6, p. 31-35.

Methods and equipment used to mark over 1 million B. tyrannus and B. patronus along the Atlantic and Gulf coasts of th U.S. from 1966-1971.

Raney, Edward C.

1952. The life history of the striped bass, Roccus saxatilis (Walbaum). Bulletin of the Bingham Oceanographic Collection, Yale University, vol. 14, art. 1, p. 5-97.

Menhaden is listed as a food item of the striped bass.

Rass, Theodore S.

1936. On types of fish eggs and their bearing on the classification of fishes. Doklady Akademii Nauk S.S.S.R., Seriya Biologiya, vol. 2, no. 7, p. 303-307.

Compared three types of clupeid eggs and allied Brevoortia with Sardina, Sardinella, and Clupeionella rather than with Alosa and Caspialosa.

Rass, Theodore S.

1937. Pigmentation of embryos and larvae in the herring family (Clupeidae) as an adaptation to a pelagic mode of life. Byulleten' Moskovskogo Obshchestva Ispytatelei Prirody, Otdel Biologicheskii, S.S.S.R., vol. 56, p. 155-164.

Groups Brevoortia with other pelagic clupeids that have pigment along dorsal aspect of larvae presumably to protect nervous system from sunlight (In Russian with English summary).

Rass, T. S.

1967. Geographical principles for the development of fisheries in the world's ocean (in Russian). Gidrobiologicheskiy Zhurnal, vol. 3, no. 5, p. 22-31.

Menhaden, Brevoortia sp., occur in Southern Boreal (moderately warm waters).

Rawls, Charles K.

1965. Field tests of herbicide toxicity to certain estuarine animals. Chesapeake Science, vol. 6, no. 3, p. 150-161.

B. tyrannus mentioned.

Ray, Clayton E., Alexander Wetmore, David H. Dunkle, and Paul Drez.

1968. Fossil vertebrates from the marine Pleistocene of Southeastern Virginia. Smithsonian Miscellaneous Collection, vol. 153, no. 3, Publication 4742, 25 p.

Brevoortia sp.: Menhaden. Specimens identified are a preoperculum (USNM 25064) and an operculum (USNM 25065). The genus is known from the Pliocene of North Africa but is previously unrecognized as a fossil in North America. Its recent distribution in the Western Atlantic is from Brazil to Nova Scotia.

Recksiek, Conrad W., and James D. McCleave.

1973. Distribution of pelagic fishes in the Sheepscot River-Back River Estuary, Wiscasset, Maine. Transactions of the American Fishery Society, vol. 102, no. 3, p. 541-551.

Atlantic menhaden among the species reported.

Reintjes, John W.

1963. An initial inquiry into a photoelectric device to detect menhaden marked with fluorescent pigments. International Commission for the Northwest Atlantic Fisheries, North Atlantic Fish Marking Symposium, Special Publication no. 4, p. 362-368.

Unsuccessful preliminary attempts to mark menhaden with fluorescent pigments for electronic detection.

Reintjes, John W.

1964a. Annotated bibliography on biology of menhadens and menhaden-like fishes of the world. U.S. Fish and Wildlife Service, Fishery Bulletin, vol. 63, no. 3, p. 531-549.

Bibliography of Brevoortia, Ethmalosa and Ethmidium with major references to 1957 and all references, 1958-62.

Reintjes, John W.

1964b. The importance of the occurrence of menhaden in the coastal waters and estuaries of peninsular Florida. Proceedings of the Gulf and Caribbean Fisheries Institute, 16th Annual Session, 1963, p. 108-112.

The distribution and potential fishery for three species of Brevoortia in Florida is discussed.

Reintjes, John W.

1969. Synopsis of biological data on the Atlantic menhaden, Brevoortia tyrannus. U.S. Fish and Wildlife Service, Circular 320, 30 p. (FAO Species Synopsis no. 42).

Taxonomy, morphology, distribution, reproduction, life history, growth, behavior and abundance of Atlantic menhaden with data on size, age, and sex composition of the commercial catch. Description of fishing methods and equipment.

Reintjes, John W.

1970. The Gulf menhaden and our changing estuaries. Proceedings of the Gulf and Caribbean Fisheries Institute, 22nd Annual Session, 1969, p. 87-90.

A brief review of the role of estuaries in the life cycle of Gulf menhaden, B. patronus.

Reintjes, John W.

1971. Five-spot herring, Hilsa kelee, a potential marine resource of South India, p. 162-163. (Abstract). In Symposium on Indian Ocean and adjacent seas, their origin, science and resources. Marine Biological Association of India, Cochin.

Relation of American menhaden purse-seine fishery to potential resource of five-spot herring in the Indian Ocean.

Reintjes, John W., and Anthony L. Pacheco.

1966. The relation of menhaden to estuaries, p. 50-58. In A symposium on estuarine fisheries. American Fisheries Society, Special Publication no. 3.

Review of early life history of menhaden including oceanic spawning and the effects of temperature and salinity on the establishment and survival in estuarine nurseries.

Reintjes, John W., James Y. Christmas, Jr., and Richard A. Collins.

1960. Annotated bibliography on biology of American menhaden. U.S. Fish and Wildlife Service, Fishery Bulletin, vol. 60, no. 170, p. 297-322.

A review of the literature on the distribution, occurrence, abundance, life history, morphology, ecology and behavior of menhaden, genus Brevoortia, published prior to and during 1957.

Renfro, William C.

1960. Salinity relations of some fishes in the Aransas River, Texas. Tulane Studies in Zoology, vol. 8, p. 83-91.

Juvenile B. patronus collected in salinities from 0.5 to 54.3 ppt.

Renfro, William C.

1963. Gas-bubble mortality of fishes in Galveston Bay, Texas. Transactions of the American Fisheries Society, vol. 92, no. 3, p. 320-322.

Postlarval B. patronus mentioned.

Richards, C. E., and M. Castagna.

1970. Marine fishes of Virginia's eastern shore (inlet and marsh, seaside waters). Chesapeake Science, vol. 11, no. 4, p. 235-248.

B. tyrannus is included.

Richards, William L.

1968. Ecology and growth of juvenile tarpon, Megalops atlanticus, in a Georgia salt marsh. Bulletin of Marine Science, vol. 18, no. 1, p. 220-239.

Menhaden occurred in seine samples.

Robas, John S.

1961. The multiple-use of shrimp trawlers. Proceedings of the Gulf and Caribbean Fisheries Institute, 13th Annual Session, 1960, p. 59-62.

Menhaden fishery is mentioned.

Roessler, Martin A.

1970. Checklist of fishes in Buttonwood Canal, Everglades National Park, Florida, and observations on the seasonal occurrence and life histories of selected species. Bulletin of Marine Science, vol. 20, no. 4, p. 860-893.

B. smithi and hybrids by season, salinity, temperature, rainfall, and moon phase.

Roithmayr, Charles M.

1963. Distribution of fishing by purse-seine vessels for Atlantic menhaden, 1955-1959. U.S. Fish and Wildlife Service, Special Scientific Report - Fisheries no. 434, 22 p.

Monthly distribution of purse-seine sets along the Atlantic coast of the U.S. for a 5-year period. Information obtained from logbooks kept by vessel personnel.

Roithmayr, Charles M., and Richard A. Waller.

1963. Seasonal occurrence of Brevoortia patronus in the northern Gulf of Mexico. Transactions of the American Fisheries Society, vol. 92, no. 3, p. 301-302.

Monthly offshore distribution.

Romer, Alfred Sherwood.

1966. Vertebrate paleontology. University of Chicago Press, Chicago, 468 p.

Fossil Brevoortia represented from Pliocene of North Africa and questionably reported from recent era.

Rose, Milton M.

1968. Illustrated list of common and scientific names of fishes from the Gulf of Mexico in Latin, Spanish, Russian and English. U.S. Department of Interior, Bureau of Commercial Fisheries, Branch of Foreign Fisheries (Translations), no. A-18, 46 p.

B. patronus included.

Rounsefell, George A.

1963. Realism in the management of estuaries. Alabama Marine Resources Laboratory, Resources Bulletin, no. 1, 13 p.

Estuaries play an important part in maintaining B. patronus and B. gunteri fishery.

Rounsefell, George A.

1964. Preconstruction study of the fisheries of the estuarine areas traversed by the Mississippi River-Gulf outlet project. U.S. Fish and Wildlife Service, Fishery Bulletin, vol. 63, no. 2, p. 373-393.

Occurrence of menhaden (Brevoortia sp.) from otter trawl catches in eight areas. Greatest abundance in salinities from 1.0 - 5.0 ppt.

Rounsefell, George A.

1971. Potential food from the sea. Journal of Marine Science, Marine Science Institute, Bayou La Batre, Ala. vol. 1, no. 3, p. 1-82.

Menhaden mentioned p. 58 and 61.

Royce, William F.

1972. Introduction to the fishery sciences. Academic Press, New York, 351 p.

Brief mention of the menhaden fishery.

Russell-Hunter, W. D.

1970. Aquatic productivity: An introduction to some basic aspects of biological oceanography and limnology. Macmillan, New York, 306 p.

Menhaden trophic relations incorrectly reported as fourth in a food chain: diatoms--copepods--sand lance--menhaden. Also brief mention of fishery and fish meal and oil industry.

Sal'nikov, N. E.

1969. Fishery research in the Gulf of Mexico and the Caribbean Sea, p. 78-171. In A.S. Bogdanov [ed.], Soviet-Cuban fishery research. National Technical Information Service, TT 69-59016.

B. patronus, B. gunteri, and B. smithi considered in the major fishery resources of the Gulf of Mexico.

Sams, Manfredo.

1968. Use of aircraft in fishing detection...capture...research, p. 173-175. In De Witt Gilbert [ed.], The future of the fishing industry of the United States. University of Washington, Publications in Fisheries, New Series, vol. 4.

Menhaden purse-seine fishing mentioned, with three aerial photographs.

Saunders, Dorothy Chapman.

1964. Blood parasites of marine fish of southwest Florida including a new haemogregarine from the menhaden, Brevoortia tyrannus (Latrobe). Transactions of the American Microscopical Society, vol. 83, no. 2, p. 218-225.

Haemogregarina brevoortiae discovered in three of 46 specimens of B. tyrannus.

Sawyer, Roy T., and Norman A. Chamberlain.

1972. A new species of marine leech (Annelida:Hirudinea) from South Carolina, parasitic on the Atlantic menhaden, Brevoortia tyrannus. Biological Bulletin (Woods Hole), vol. 142, no. 3, p. 470-479.

A new species of marine leech, Calliobdella carolinensis, is reported from the estuaries of South Carolina on the clupeid fishes, the Atlantic menhaden and the blueback herring, Alosa aestivalis. The leech, which is provisionally assigned to the genus, Calliobdella, has the following characteristics: 14-midbody segments, 2 pairs of cephalic ocelli, no ocelli on caudal sucker, 11 pairs of pulsatile vesicles and a well-developed medial, muscular organ which functions as a seminal receptacle.

Sawyer, Roy T., and Donald L. Hammond.

1973. Observations on the marine leech Calliobdella carolinensis (Hirudinea: Pisciolidae), epizootic on the Atlantic menhaden. Biological Bulletin, vol. 145, no. 2, p. 373-388.

Epizootic outbreak of marine leech on Brevoortia tyrannus in South Carolina.

Schaaf, William Edward.

1972. Dynamics of the Atlantic menhaden, Brevoortia tyrannus, population from statistics of the purse-seine fishery: 1955-1969. Ph.D. thesis, University of Michigan, Ann Arbor, 42 p. (Dissertation Abstracts International, vol. 33, p. 5153-B).

Analysis of catch and effort data from Atlantic menhaden purse-seine fishery to determine the catch-per-unit-effort, natural and fishing mortality rates and maximum sustainable yield.

Schaaf, William E., and Gene R. Huntsman.

1972a. An analysis of the Atlantic menhaden, Brevoortia tyrannus, (Pisces:Clupeidae) purse-seine fishery, 1955-69. (Abstract). ASB (Association of Southeastern Biologists) Bulletin, vol. 19, no. 2, p. 97.

Analysis of catch and effort data to determine the catch-per-unit-of-effort, natural and fishing mortality rates and maximum sustainable yield.

Schaaf, William E., and Gene R. Huntsman.

1972b. Effects of fishing on the Atlantic menhaden stock: 1955-1969. Transactions of the American Fisheries Society, vol. 101, no. 2, p. 290-297.

Analysis of catch and effort data to determine the catch-per-unit-of-effort, natural and fishing mortality rates and maximum sustainable yield.

Schaefer, Richard H.

1967. Species composition, size and seasonal abundance of fish in the surf waters of Long Island. New York Fish and Game Journal, vol. 14, no. 1, p. 1-46.

B. tyrannus ranked 5th (1961), 14th (1962), and 10th (1963) in abundance and ranged from 70-440 mm in length.

Schaefer, Richard H.

1970. Feeding habits of striped bass from the surf waters of Long Island. New York Fish and Game Journal, vol. 17, no. 1, p. 1-17.

B. tyrannus in stomach contents of striped bass in fall.

Schaefers, Edward A.

1964. Highlights of the Second World Fishing Gear Congress. Proceedings of the Gulf and Caribbean Fisheries Institute, 16th Annual Session, 1963, p. 25-30.

Menhaden purse-seining mentioned.

Schmitt, Michael D.

1972. The abundance and size of Gulf menhaden, Brevoortia patronus, caught by seine haul in Mulatto Bayou, near Pensacola, Florida, from June, 1969 to June, 1971. (Abstract). Quarterly Journal of the Florida Academy of Sciences, vol. 35, suppl. to no. 1, p. 15.

B. patronus present during all months except December 1969 and January 1970, and ranged in size from 20-30 mm to 60-100 mm.

Schwartz, Frank J.

1960. Additional comments on adult bull sharks Carcharhinus leucas (Mueller and Henle), from Chesapeake Bay, Maryland. Chesapeake Science, vol. 1, no. 1, p. 68-71.

Cites B. patronus as food item.

Schwartz, Frank J.

1964. Fishes of Isle of Wight and Assawoman Bays near Ocean City, Maryland. Chesapeake Science, vol. 5, no. 4, p. 172-193.

A brief mention of seasonal distribution of B. tyrannus schools in this area.

Schwartz, Frank J.

1964-65. A pugheaded menhaden from Chesapeake Bay. Underwater Naturalist, vol. 3, no. 1, p. 22-24.

First report of pugheadedness in B. tyrannus.

Schwartz, Frank J.

1972. World literature to fish hybrids, with an analysis by family, species and hybrid. Publications of the Gulf Coast Research Laboratory Museum, no. 3, 328 p.

Cites Dahlberg (1966, 1969a, 1969b and 1970a), Hettler (1968 and 1971), Reintjes (1969) and Turner (1969).

Schwartz, Frank J., and Jim Tyler.

1970. Marine fishes common to North Carolina. North Carolina Department of Conservation and Development, Division of Commercial and Sports Fisheries, 32 p.

Menhaden, B. tyrannus, pictured but not discussed.

Shaklee, James B.

1972. A genetic, biochemical, and evolutionary characterization of LDH isozyme structure in fishes. Ph.D. thesis, Yale University, 244 p. (Dissertation Abstracts, vol. 34, no. 1, p. 88-B.)

Comparison of B. tyrannus to other clupeids and marine fishes.

Sherk, J. Albert, Jr.

1971. The effects of suspended and deposited sediments on estuarine organisms. Chesapeake Biological Laboratory, Solomons, Md., Contribution no. 443, 73 p.

B. tyrannus juveniles used in bioassay experiments were killed at most concentrations of residues during first 24 hours but no mortalities after 24 hours with concentrations up to 10 percent.

Sindermann, Carl J.

1962. Serology of Atlantic clupeoid fishes. American Naturalist, vol. 96, no. 889, p. 225-231.

Relationship of Brevoortia to western Atlantic clupeids, Alosa and Clupea.

Sindermann, Carl J.

1970. Principal diseases of marine fish and shellfish. Academic Press, New York, 369 p.

Diseases of B. tyrannus and parasites of B. tyrannus, B. patronus and B. smithi.

Sindermann, Carl J., and Kenneth A. Honey.

1963. Electrophoretic analysis of the hemoglobins of Atlantic clupeoid fishes. Copeia, 1963, no. 3, p. 534-537.

There were no variant patterns that could be used to determine discreteness of subpopulations among the five species tested including B. tyrannus.

Smith-Vaniz, William F.

1968. Freshwater fishes of Alabama. Auburn University, Agricultural Experiment Station, Auburn, Ala. 211 p.

B. patronus listed.

Sulya, L. L., B. E. Box, and Gordon Gunter.

1960. Distribution of some blood constituents in fishes from the Gulf of Mexico. American Journal of Physiology, vol. 199, no. 6, p. 1177-1180.

Chloride, cholesterol, hemoglobin, potassium, and sodium content of B. patronus blood.

Sutherland, Doyle F.

1963. Variation in vertebral numbers of juvenile Atlantic menhaden. U. S. Fish and Wildlife Service, Special Scientific Report - Fisheries no. 435, 21 p.

Analysis of variance of mean vertebral numbers of B. tyrannus indicated two subpopulations along the Atlantic coast of the U.S.

Suttkus, Royal D.

1970. Type specimens of fishes in the Tulane University collection with a brief history of the collection. Tulane Studies in Zoology and Botany, vol. 16, no. 3, p. 116-130.

Paratype of B. gunteri.

Svetovidov, A. N.

1964. Systematics of the North American anadromous clupeoid fishes of the genera Alosa, Caspialosa, and Pomolobus. Copeia, 1964, no. 1, p. 118-130.

Skull structure and alar scales on caudal lobes of Brevoortia are illustrated with a brief description.

Swingle, Hugh A.

1971. Biology of Alabama estuarine areas--Cooperative Gulf of Mexico estuarine inventory. Alabama Marine Resources Laboratory, Marine Resources Bulletin, no. 5, 123 p.

Gulf menhaden, B. patronus, included with catch by area, gear, and salinity.

Sykes, James E.

1964. Requirements of Gulf and south Atlantic estuarine research. Proceedings of the Gulf and Caribbean Fisheries Institute, 16th Annual Session, 1963, p. 113-120.

Mentions the importance of Tampa Bay estuaries to commercially important fishes such as B. patronus and B. smithi.

Sykes, James E.

1965. Multiple utilization of Gulf coast estuaries. Proceedings of the 17th Annual Conference, Southeastern Association of Game and Fish Commissioners, 1963, p. 323-326.

Menhaden mentioned as one of the more important estuarine-dependent species.

Sykes, James E.

1968. Commercial values of estuarine-generated fisheries on the south Atlantic and Gulf of Mexico coasts, p. 73-78. In John D. Newsom [ed.], Proceedings of the Marsh and Estuary Management Symposium. Thomas J. Moran's Sons, Inc., Baton Rouge.

Importance of menhaden fishery.

Sykes, James E.

1971. Implications of dredging and filling in Boca Ciega Bay, Florida. Environmental Letters, vol. 1, no. 2, p. 151-156.

B. patronus and B. smithi listed among more valuable species.

Sykes, James E., and John H. Finucane.

1966. Occurrence in Tampa Bay, Florida, of immature species dominant in Gulf of Mexico commercial fisheries. U.S. Fish and Wildlife Service, Fishery Bulletin, vol. 65, no. 2, p. 369-379.

B. patronus and B. smithi among species collected by size, season, and area.

Tabb, Durbin C.

1961. A contribution to the biology of the spotted seatrout, Cynoscion nebulosus (Cuvier) of east central Florida. Florida Board of Conservation, Technical Series no. 35, 24 p.

Brevoortia sp. listed as a food of spotted seatrout.

Tabb, Durbin C.

1966. Treasure those estuaries! Proceedings of the Gulf and Caribbean Fisheries Institute, 18th Annual Session, 1965, p. 47-50.

Menhaden mentioned.

Tagatz, Marlin E.

1968. Fishes of the St. Johns River, Florida. Quarterly Journal of the Florida Academy of Sciences, 1967, vol. 30, no. 1, p. 25-50.

B. tyrannus and B. smithi listed.

Tagatz, Marlin E., and E. Peter H. Wilkens.

1973. Seasonal occurrence of young Gulf menhaden and other fishes in a northwestern Florida estuary. National Marine Fisheries Service, Special Scientific Report - Fisheries no. 672, 14 p.

Monthly occurrence and size of B. patronus from plankton net, seine and surface trawl collections made in Pensacola Bay, December 1969 to October 1971.

Talbot, G. B., and Staff.

1963. Annual report of the Bureau of Commercial Fisheries Biological Laboratory, Beaufort, N.C., for the fiscal year ending June 30, 1961. U.S. Fish and Wildlife Service, Circular 148, 40 p.

A review of menhaden research including population studies, estimation of juvenile abundance, development of methods of marking juveniles and sampling the Atlantic purse-seine landings.

Talbot, G. B., and Staff.

1964. Annual report of the Bureau of Commercial Fisheries Biological Laboratory, Beaufort, N.C., for the fiscal year ending June 30, 1962. U.S. Fish and Wildlife Service, Circular 184, 40 p.

A review of menhaden research including population studies, estuarine biology of young, estimation of juvenile abundance, methods of marking and recovery and catch sampling.

Taylor, John L.

1970. Coastal development in Tampa Bay, Florida. Marine Pollution Bulletin, vol. 1 (NS), no. 10, p. 153-156.

Menhaden, B. patronus, included.

Taylor, J. M.

1887. Dead fish along the coast of South Carolina. Bulletin of the U.S. Fish Commission for 1886, vol. 6, p. 413-414.

Large numbers of dead juvenile Atlantic menhaden occurred near Pawley's Island December 24-25, 1886. Proposed cause from sulferous fumes carried ashore by prevailing southerly winds.

Tebo, L. B., Jr., and Edward G. McCoy.

1964. Effect of sea-water concentration on the reproduction and survival of largemouth bass and bluegills. Progressive Fish-Culturist, vol. 26, no. 3, p. 99-106.

Menhaden as probable food of largemouth bass.

Thompson, John R.

1959. Exploratory fishing for sardine-like fishes in the Gulf of Mexico. Proceedings of the Gulf and Caribbean Fisheries Institute, 11th Annual Session, 1958, p. 38-40.

Menhaden fishery mentioned.

Tracy, Henry C.

1920a. The clupeoid cranium in its relation to the swimbladder diverticulum and the membranous labyrinth. Journal of Morphology, vol. 33, p. 439-483.

B. tyrannus included in the report that concerned mainly Pomolobus pseudoharengus.

Tracy, Henry C.

1920b. The membranous labyrinth and its relation to the precoelomic diverticulum of the swimbladder in clupeoids. Journal of Comparative Neurology, vol. 31, no. 4, p. 219-257.

B. tyrannus included.

Turnage, Don.

1964. A survey of fishes in Lake Palourde, Louisiana. Proceedings of the Louisiana Academy of Sciences, vol. 27, p. 8-11.

B. patronus mentioned.

Turner, William R.

1969. Life history of menhadens, in the eastern Gulf of Mexico. Transactions of the American Fisheries Society, vol. 98, no. 2, p. 216-224.

Distribution of eggs, larvae and adults of B. patronus and B. smithi with evidence showing hybridization of the two species.

Turner, William R.

1971. Occurrence of Brevoortia gunteri in Mississippi Sound. Quarterly Journal of the Florida Academy of Sciences, vol. 33, no. 4, p. 273-274.

Extension of range eastward into Mississippi Sound.

Turner, William R.

1973. Estimating year-class strength of juvenile menhaden, p. 37-47. In A. L. Pacheco [ed.], Proceedings of a Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries. National Marine Fisheries Service, Middle Atlantic Coastal Fisheries Center, Technical Publication no. 1.

Results of mark-recapturing, beach seining and surface trawling to estimate population size of juvenile B. tyrannus, 1961-66.

Turner, William R., and George N. Johnson.

1972. Standing crops of aquatic organisms in five South Carolina tidal streams, p. 179-191. In Port Royal Sound environmental study. South Carolina Water Resources Commission.

Atlantic menhaden ranked 9th. The first four, Bay anchovy, Atlantic silverside, striped mullet, and white perch accounted for more than 95 percent of the catch.

Turner, William R., and Richard B. Roe.

1967. Occurrence of the parasitic isopod Olencira praegustator in the yellowfin menhaden, Brevoortia smithi. Transactions of the American Fisheries Society, vol. 96, no. 3, p. 357-359.

Olencira praegustator parasitized B. smithi but was not found in the branchial chamber of B. patronus.

Tyler, A. V.

1971. Periodic and resident components in communities of Atlantic fishes. Journal of the Fisheries Research Board of Canada, vol. 28, no. 7, p. 935-946.

B. tyrannus in table from Massmann (1962).

Vasil'ev, G. D., and Yu. A. Torin.

1969. Oceanographic and fishing-biological characteristics of the Gulf of Mexico and the Caribbean Sea, p. 225-250. In A. S. Bogdanov [ed.], Soviet-Cuban fishery research. National Technical Information Service, TT 69-59016.

Menhaden schools fished by United States.

Wang, Johnson C. S., and Edward C. Raney.

1971. Distribution and fluctuations in the fish fauna of the Charlotte Harbor Estuary, Florida. Charlotte Harbor Estuarine Studies, Mote Marine Laboratory, Sarasota, Fla., 56 p., appendix 46 p.

Occurrence of B. smithi by size and month.

Ward, B. Q., B. J. Carroll, E. S. Garrett, and G. B. Reese.

1967. Survey of the U.S. Atlantic coast and estuaries from Key Largo to Staten Island for the presence of Clostridium botulinum. Applied Microbiology, vol. 15, no. 4, p. 964-965.

Brevoortia sample from Reedville, Va., botulism-positive.

Warlen, Stanley M.

1969. Additional records of pugheaded Atlantic menhaden, Brevoortia tyrannus. Chesapeake Science, vol. 10, no. 1, p. 67-68.

Reporting an adult B. tyrannus from Chesapeake Bay and a juvenile from Neuse River, N.C., with deformed snouts.

Wass, Marvin L., and Thomas D. Wright.

1969. Coastal wetlands of Virginia. Virginia Institute of Marine Science, Gloucester Point, Special Report in Applied Marine Science and Ocean Engineering, no. 10, 153 p.

B. tyrannus use nursery areas, p. 28 and 38. Catch of Chesapeake Bay, table 5.

Wastler, T. A.

1968. Municipal and industrial wastes and the estuaries of the south Atlantic and Gulf coasts, p. 114-119. In John D. Newsom [ed.], Proceedings of the Marsh and Estuary Management Symposium. Thomas J. Moran's Sons, Inc., Baton Rouge.

Large menhaden kill at Charleston, S.C., caused by organophosphorus compound discharged by a chemical manufacturing plant.

Watson, E. E.

1911. The genus Gyrocotyle, and its significance for problems of cestode structure and phylogeny. University of California, Publications in Zoology, vol. 6, no. 15, p. 353-468.

B. tyrannus infested with Bomolochus teres.

White, Ronald L., and John T. Lane.

1968. Evaluation of the menhaden fishery in Delaware Bay. New Jersey Department of Conservation and Economic Development, Marine Fisheries Section. Project 3-2-R-2, 22 p.

Menhaden fishery does not threaten the Delaware Bay shellfish and sport fisheries.

Whitehead, P. J. P.

1963a. A contribution to the classification of clupeoid fishes. Annals and Magazine of Natural History, vol. 5, no. 60, p. 737-750.

Pelvic scute structure in Brevoortia mentioned.

Whitehead, P. J. P.

1963b. A revision of the recent round herrings (Pisces: Dussumieriidae). Bulletin of the British Museum (Natural History) Zoology, vol. 10, no. 6, p. 307-380.

B. patronus mentioned.

Whitehead, P. J. P.

1965. The identity of Clupea sadina Mitchill, 1814. Copeia, 1965, no. 2, p. 228-230.

Brevoortia mentioned because of scapular spot.

Whitehead, P. J. P.

1967. The clupeoid fishes described by Lacepede, Cuvier, and Valenciennes. Bulletin of the British Museum (Natural History) Zoology, Suppl. 2, 180 p.

Brevoortia mentioned in the accounts of *Alosa* and *Ethmalosa*.

Whitehurst, Jonathan W.

1973. The menhaden fishing industry in North Carolina. University of North Carolina, Sea Grant Program Publication UNC-SG-72-12, 52 p.

Historical and geographical review of the menhaden fishery for *B. tyrannus* in North Carolina with information to 1970.

Whitworth, Walter R., Peter L. Berrien, and Walter T. Keller.

1968. Freshwater fishes of Connecticut. State Geological and Natural History Survey of Connecticut, Bulletin 101, 134 p.

B. tyrannus listed as a visitor from salt water. Atlantic herring given incorrectly as the common name.

Wilber, Charles G., Paul F. Robinson, and Joseph B. Hunn.

1961. Heart size and body size in fish. Anatomical Record, vol. 140, no. 4, p. 285-288.

B. tyrannus included.

Wiley, Martin L., Ted S. Y. Koo, and L. Eugene Cronin.

1973. Finfish productivity in coastal marshes and estuaries, p. 139-150. *In* R. H. Chabreck, [ed.], Proceedings of the Coastal Marsh and Estuary Management Symposium, Louisiana State University.

Menhaden listed as being estuarine dependent.

Wilkens, E. Peter H., and Robert M. Lewis.

1971. Abundance and distribution of young Atlantic menhaden, Brevoortia tyrannus, in the White Oak River estuary, North Carolina. National Marine Fisheries Service, Fishery Bulletin, vol. 69, no. 4, p. 783-789.

The effect of salinity, temperature, tide, turbidity and illumination on the distribution of larvae, prejuveniles, and juveniles of B. tyrannus in an estuary.

Williams, Austin B., and Earl E. Deubler, Jr.

1968. Studies on macroplanktonic crustaceans and ichthyoplankton of the Pamlico Sound complex. North Carolina Department of Conservation and Development, Division of Commercial and Sports Fisheries, Special Scientific Report No. 13, 103 p.

Young of B. tyrannus distributed throughout ecosystem.

Williams, A. K., and Carl R. Sova.

1966. Acetylcholinesterase levels in brains of fishes from polluted waters. Bulletin of Environmental Contamination and Toxicology, vol. 1, no. 5, p. 198-204.

Comparison of AChE levels in B. tyrannus from unpolluted and polluted waters.

Williams, George C.

1968. Bathymetric distribution of planktonic fish eggs in Long Island Sound. Limnology and Oceanography, vol. 13, no. 2, p. 382-385.

Atlantic menhaden eggs included in the analysis.

Wilson, H. V.

1900. Marine biology at Beaufort. American Naturalist, vol. 34, no. 401, p. 339-360.

Menhaden mentioned.

Wolfe, D. A., and T. R. Rice.

1972. Cycling of elements in estuaries. National Marine Fisheries Service, Fishery Bulletin, vol. 70, no. 3, p. 959-972.

Atlantic menhaden mentioned as reservoir and pathway of elemental flux in estuarine ecosystems.

Yamaguti, Satyu.

1963. Parasitic Copepoda and Branchiura of fishes. John Wiley and Sons, New York, 1104 p.

Previously described copepod parasites (Caligus, Bomolochus, Lernanthropus, Lernaeenicus, and Clavellisa) of Brevoortia sp. are listed and many are illustrated.

Yokel, B. J., M. A. Roessler, and E. S. Iversen.

1967. Fishes and juvenile stages of pink shrimp (Penaeus duorarum) collected in Buttonwood Canal, Florida, December 1962 to June 1965. U.S. Fish and Wildlife Service, Data Report 22, 57 p.

Number of B. smithi and other fishes by tidal net collection.

Young, James S., and Charles I. Gibson.

1973. Effect of thermal effluent on migrating menhaden. Marine Pollution Bulletin, vol. 4, no. 6, p. 94-96.

Juvenile B. tyrannus were killed in August and September 1971 when they swam into the discharge plume of an electric generating station near Northport, Long Island, N.Y. Water temperatures in the discharge were 37°C.

Zilberberg, Mark H.

1966. Seasonal occurrence of fishes in a coastal marsh of northwest Florida. Publications of the University of Texas, Institute of Marine Science, vol. 11, p. 126-134.

B. smithi listed.

Abnormalities
Austin and Hickey 1973
Dahlberg 1970b
Dawson 1966, 1971
Godwin and Vaughn 1968
Hettler 1968
Hoff 1970
Kroger and Guthrie 1971
Lewis 1966
Merriner and Wilson 1972
Musik and Hoff 1968
Schwartz 1964
Warlen 1969

Anatomy
Bertmar et al. 1969
Harder 1964
June 1965
June and Carlson 1971
June et al. 1963
Miller 1969
Miller and Jorgenson 1973
Monod 1968
Moulton 1967
Moulton and Lerner 1963
Nelson 1967a, 1967b
Sutherland 1963
Svetovidov 1964
Whitehead 1963a
Wilber et al. 1961

Behavior
Blaxter and Holliday 1963
Breder 1959
Meldrim 1971
Moulton 1956, 1963, 1967
Moulton and Lerner 1963
Nicholson 1972a, 1972b
Oviatt et al. 1972

Bibliography
Atz 1971
Crance 1971
Livingstone 1965
Love 1970
Reintjes 1964a
Reintjes et al. 1960
Schwartz 1972

Brevoortia aurea
Berry 1964
Ciechomoski 1968
Hildebrand 1963
Jordan 1887
Miller 1969

Brevoortia gunteri
Baldauf and Huq 1963
Cobb et al. 1968
Compton 1965
Dahlberg 1966, 1970a
Hoese 1965
Jones 1965
Miller and Jorgenson 1973
Norden 1966
Parker 1965
Sal'nikov 1969
Suttkus 1970

Brevoortia patronus
Baldauf and Huq 1963
Baldauf et al. 1970
Baughman and Springer 1950
Beasley 1969
Bogdanov et al. 1968
Breder and Rosen 1966
Burns 1970
Butler 1966
Chambers and Sparks 1959
Chapoton 1970
Combs 1969
Compton 1965
Copeland 1965
Crittenden 1958
Dahlberg 1966, 1969b, 1970a
Dunham 1972
Fore and Baxter 1972a, 1972b
Herke 1968, 1969, 1971
Hoese 1965
Hoese et al. 1968
Johnson 1966, 1973
Jones et al. 1963
Kelly and Dragovich 1968
Love et al. 1959
McFarland 1963
Miller 1965
Miller and Jorgenson 1973
Moseley and Copeland 1969
Norden 1966
Parker 1965
Perret 1966
Reintjes 1970
Roithmayr and Waller 1965
Sal'nikov 1969
Schmitt 1972
Smith-Vaniz 1968
Sulya et al. 1960
Swingle 1971
Tagatz and Wilkens 1973

Brevoortia smithi
Altman and Dittmer 1966
Butler 1966
Christiansen 1965
Dahlberg 1966, 1969b, 1970a, 1972
Finucane 1969a, 1969b
Gunter and Hall 1963

Hettler 1971, 1973
Jorgenson and Miller 1968
Levi 1973
McLane 1955
Miller and Jorgenson 1969, 1973
Roessler 1970
Sal'nikov 1969
Tagatz 1968
Wang and Raney 1971
Yokel et al. 1967
Zilberberg 1966

Brevoortia tyrannus
Ahlstrom 1968
Altman and Dittmer 1964
Bearden 1967
Beasley 1969
Breder and Rosen 1966
Carlson 1945
Carlson and Reintjes 1972
Chipman 1959
Christensen 1965
Cooper 1965
Croker 1965
Dahlberg 1966, 1969a, 1969b, 1970a, 1970b, 1972
Dahlberg and Odum 1970
Dryfoos et al. 1973
Evermann and Kendall 1900
Foehrenbach 1972
Gunter and Hall 1963
Heald 1968
Hela 1967
Henry 1965, 1968, 1971
Higham and Nicholson 1964
Jorgenson and Miller 1968
Joseph 1962
June et al. 1963
Keup and Bayless 1964
Lippson 1973
Love et al. 1959
Lukton and Olcott 1958
Lux and Nichy 1971
McCall and Rossiter 1952a, 1952b
McHugh 1957, 1969a, 1969b
Marcellus 1972
Massmann 1962
Massmann and Mansueti 1963
Mead 1898
Meldrim and Gift 1971
Miller and Jorgenson 1969, 1973
Moss and McFarland 1970
Mulkana 1966
Muncy 1960
Nicholson 1971a, 1971b, 1972a, 1972b
Nicholson and Higham 1964a, 1964b
Norcross and Harrison 1967
Odum 1968
Reintjes 1969
Roithmayr 1963
Schaaf 1972
Schaaf and Huntsman 1972a, 1972b
Tagatz 1968
Talbot et al. 1962, 1963
Turner and Johnson 1972
Wass and Wright 1969
Williams and Sova 1966
Williams 1968

Chemical Composition
Altman and Dittmer 1964
Burkholder et al. 1968
Cocoros 1971
Cocoros et al. 1973
Dahlberg 1966, 1969a
Di Capua 1966, 1969
Love et al. 1959
Lukton and Olcott 1958
McColl and Rossiter 1952a, 1952b
Manski 1964
Perkins and Dahlberg 1971
Shaklee 1972
Sulya et al. 1960
Williams and Sova 1966

Development
Chapoton 1967
Hettler 1968, 1970, 1973
Higham and Nicholson 1964
June and Carlson 1971
Lewis et al. 1972

Distribution
Böhlke and Chaplin 1968
Crance 1971
Derickson and Price 1973
Dryfoos et al. 1973
Dahlberg 1966, 1970a
Kinnear 1973
June 1972
Roithmayr 1963
Turner 1973

Egg
Ahlstrom 1968
Blaxter 1969
Ciechomski 1968
Colton and Marak 1969
Dovel 1968, 1971
Fore 1971
Hettler 1970, 1973
Mansueti and Hardy 1967
Marine Research Inc. 1973
Rass 1936
Reintjes 1969
Williams 1968

Feeding
Bertmar et al. 1969
Breder 1959
Day et al. 1973
Gusev 1964

Harder 1964
June and Carlson 1971, 1973
Miller 1969
Mulkana 1966
Peters 1972
Russell-Hunter 1970
Wolfe and Rice 1972

Growth
June and Nicholson 1964
McHugh 1967
Mulkana 1966
Nicholson and Higham 1964a, 1964b, 1965, 1966

Hybridization
Dahlberg 1966, 1969a, 1969b, 1970a
Hettler 1968, 1971
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Roessler 1970
Schwartz 1972
Turner 1969

Larva
Ahlstrom 1968
Baldauf and Huq 1963
Blaxter 1969
Carlson 1973
Ciechomski 1968
Clark and Smith 1969
Colton and Marak 1969
Croker 1965
Dovel 1968
Fore and Baxter 1972a
Hettler 1968, 1970, 1973
June and Carlson 1971, 1973
Lewis and Mann 1971, 1973
Lewis and Wilkens 1971
Lewis, R. M. et al. 1970, 1972
Mansueti 1963
Mansueti and Hardy 1967
Marine Research Inc. 1973
Norcross and Harrison 1967
Norden 1966
Pacheco and Grant 1973
Rass 1937
Reintjes 1969

Menhaden Fishery
Alverson and Broadhead 1971
Brandt 1964
Brooks 1893
Bullis 1968
Bullis and Carpenter 1968
Butler 1961
Carlson 1945
Chapman 1964, 1966
Chapoton 1972
Clark 1967
Collins 1883
Dryfoos et al. 1973
Graham 1968
Gregg 1968
Gowanloch 1950
Gunter 1964, 1967, 1969
Gunter and Hall 1963
Henry 1965, 1968, 1969, 1971
Henry et al. 1965, 1966, 1967, 1968, 1970a, 1970b
Huntsman and Chapoton 1973
June and Nicholson 1964
Kantner 1971
Kinnear and Fuss 1971
McHugh 1966, 1969a, 1969b
Nicholson 1971a, 1971b, 1972a, 1972b
Reintjes 1969
Roithmayr 1963
Schaaf and Huntsman 1972a, 1972b
Whitehurst 1973

Occurrence
Anderson 1968
Anderson and Gehringer 1965
Burns 1970
Butler 1966
Clark 1966, 1967
Clark and Smith 1969
Clark et al. 1969
Copeland 1965
Crittenden 1958
Dahlberg and Odum 1970
Duke et al. 1966
Dunham 1972
Fahy 1966
Gunter and Hall 1963
Henry et al. 1965, 1966, 1967, 1968, 1970a, 1970b
Herke 1968, 1969, 1971
Hoese 1965
Hoese et al. 1968
Hudson River Fish. Inv. 1965-68
Johnson 1966, 1973
Jones 1965
Jones et al. 1963
June et al. 1964
Kelly and Dragovich 1968
Keup and Bayless 1968
Kinnear 1973
Klima and Tabb 1959
Lear and Pippy 1971
Lewis and Mann 1971
Lewis and Wilkens 1971
Lewis et al. 1972
Lippson 1973
Lux and Nichy 1971
McFarland 1963
Mansueti 1960b
Marcellus 1972
Marine Research Inc. 1973
Miller 1965
Miller and Jorgenson 1967
Moseley and Copeland 1969
Muncy 1960
Norden 1966

Odum 1968
Oviatt and Gray 1968
Pacheco and Grant 1965, 1973
Parker 1965
Perret 1966
Recksiek and McCleave 1973
Reintjes 1964b, 1969
Richards 1968
Richards and Castagna 1970
Roithmayr and Waller 1963
Rounsefell 1964
Schaefer 1967
Schmitt 1972
Smith-Vaniz 1968
Swingle 1971
Tagatz 1968
Tagatz and Wilkens 1973
Turner and Johnson 1972
Wang and Raney 1971
Wass and Wright 1969
Whitworth et al. 1968
Wilkens and Lewis 1971
Williams and Deubler 1968
Yokel et al. 1967

Parasites and Diseases
Alperin 1966
Briggs 1970
Dahlberg 1969b
Kingston et al. 1969
Kroger and Guthrie 1972b, 1972c
Kudo 1966
Lewis, D. H. et al. 1970
McMahon 1963
Marine Pollution Bulletin 1970
Marsh and Gorham 1905
Mazyck 1887
Mead 1898
Nahhas and Short 1965
Pearse 1947
Reintjes 1969
Renfro 1963
Saunders 1964
Sawyer and Chamberlain 1972
Sawyer and Hammond 1973
Sindermann 1970
Turner and Roe 1967
Ward et al. 1967
Wastler 1968
Watson 1911
Yamaguti 1963

Physiology
Booke 1964
Cameron 1970
Coburn and Fischer 1973
Eisler 1965
Gunter and Ward 1961
Hall 1928
Holmes and Donaldson 1969
Hoss and Baptist 1973
Love et al. 1959
Lukton and Olcott 1958
McColl and Rossiter 1952a, 1952b
Meldrim 1971
Moss and McFarland 1970
Oviatt et al. 1972
Williams and Sova 1966

Poisons and Toxic Substances
Beezhold and Stout 1973
Cahn et al. 1973
Cocoros 1971
Cocoros et al. 1973
Cross and Brooks 1973
Fairbanks et al. 1971
Finucane 1969a, 1969b
Foehrenbach 1972
Hays and Risebrough 1972
Holland et al. 1967
Hoss and Baptist 1973
Johnson 1968
Lowe 1966
Marine Pollution Bulletin 1970, 1973
Rawls 1965
Sherk 1971
Taylor 1887
Williams and Sova 1966

Predators
Alperin 1967
Arnold 1951
Baughman and Springer 1950
Bearden 1965, 1967
Day et al. 1973
Dragovich 1969
Goodyear 1967
Green 1968
Hess 1961
Kroger and Guthrie 1972a
Lorio and Schafer 1966
Manooch 1973
Mansueti 1960a, 1962a
Pearson 1929
Poole 1964
Raney 1952
Reintjes 1969
Schaefer 1970
Schwartz 1964
Tabb 1961
Tebo 1964

Reproduction
Breder and Rosen 1966
Combs 1969
Higham and Nicholson 1964
June et al. 1963

Salinity
Altman and Dittmer 1966
Blaxter and Holliday 1963

Holliday 1969
Hopkins 1973
Keup and Bayless 1964
Lewis 1965, 1966
Lewis and Hettler 1968
Massmann 1962
Massmann and Mansueti 1963
Miller and Jorgenson 1969
Reintjes and Pacheco 1966
Renfro 1960
Roessler 1970
Rounsefell 1964
Swingle 1971
Wilkens and Lewis 1971

Tagging
Carlson and Reintjes 1972
Coston 1971
Dryfoos et al. 1973
Henry et al. 1965, 1966, 1967, 1968, 1970a, 1970b
June et al. 1963
Kroger and Dryfoos 1972
Kroger et al. 1971
Parker 1972, 1973
Pristas 1970
Pristas and Willis 1973
Reintjes 1963
Turner 1973

Taxonomy
Berg 1955
Berry 1964
Dahlberg 1966
Hildebrand 1963
Jordan 1887
Manski et al. 1964
Nelson 1967a, 1967b
Reintjes 1969
Sindermann 1962
Sindermann and Honey 1963
Suttkus 1970
Whitehead 1963a, 1963b, 1965, 1967

Temperature
Clark and Brownell 1973
Fairbanks et al. 1971
General Dynamics 1971
Hoss et al. 1972
Lewis 1965, 1966
Lewis and Hettler 1968
Marine Pollution Bulletin 1973
Massmann 1962
Massmann and Mansueti 1963
Meldrim 1971
Meldrim and Gift 1971
Miller and Jorgenson 1969
Reintjes and Pacheco 1966
Roessler 1970
Wilkens and Lewis 1971
Young and Gibson 1973

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